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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON
Telephone CENTRAL 3212 (12 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street. Birmingham (Midland 0784-5)

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Human Management

MODERN industry may be divided arbitrarily into two parts. In the first group will come the small firms below a minimum size which are sufficiently small for the owner, the managing director or the general manager to know personally at least by sight and by name every individual in the factory. There is little doubt that under proper management these firms are generally the happiest because the personal relationship enables problems and difficulties to be dealt with at top level immediately they arise. We had the privilege recently of visiting such a firm, not in the chemical industry, but making instruments that are used in every industry. We were told on all sides of the happiness of this relationship and of how the managing director on his rounds through the workshops was hailed by his christian name by nearly every workman. The door to his office is open at all times and any member of the organisation whatever his rank can walk straight in and put his complaint, if he should have one, or get advice on his private problems. Organisations of this kind have been the backbone of the industrial life of the country for 200 years and more.

Management in these smaller groups is a very personal matter and depends on the tact and personality of the manager, whatever may be his official title. There are inevitably managers who are miscast, but we confess that for ourselves we are acquainted with so many well-managed concerns that we are disposed to believe that the miscast are in a very small minority.

Valuable and useful as are firms of the size and type of those included in the first group we have to acknowledge that under modern conditions it is only in certain industries or under certain conditions that these firms can continue to operate successfully. Wherever materials have to be made in large quantities the number of employees becomes so great that the management cannot know personally each individual in the undertaking. These larger concerns with from 500 to many thousands of employees need a different type of organisation. What that organisation is to be is a subject which is giving rise to much anxious thought.

What is possibly an idealised form of management has been put forward by Mr. Seebohm Rowntree who has explained his views in many speeches. A very great deal of whatever friction occurs in industry is due to a feeling on the part of the employees that they have not been fairly treated, or that they have been given orders which they dislike and for which there is no justification. The general spread of education has taken us a long way past the " their's not to reason why, their's but to do and die " attitude of management to employee. The employees themselves are generally amenable to reason but they are not prepared necessarily to accept orders blindly. Mr. Rowntree has therefore put forward the view that democracy as it is applied in a modern democratic state should be applied equally in the factory.

There must of course be a board of directors and higher management. The board of directors must be appointed by the shareholders. The management must be appointed by the board of directors. In that respect the organisation of a factory

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must be somewhat different from the political set-up of a country. The responsibility for the whole concern must be, and remain, at the top. It can be argued with every justification that only those with certain training and experience are capable of handling the affairs of a great organisation. The management of the affairs of the organisation cannot be in any way the responsibility of the workers though it may be desirable to explain to them, as to the shareholders, what is the reason for certain decisions taken and the effect on the company's fortunes of those decisions. The co-partnership scheme, so largely adopted in the gas and other industries, would automatically bring these explanations as shareholders to employees who hold shares, and through them to non-share-holding employees.

The internal management of the factory, however, is quite another matter. The management in the past has made rules to govern internal affairs. It has fixed hours of work and it has taken arbitrary action in engagement, dismissals of staff and in the making of the general regulations which govern the work of the factory. What the management has done may be completely admirable but it may not always have been acceptable to those who have been given orders because they may not have understood the need for those orders or, for other reasons, the orders may have given rise to resentment. To avoid this factory rules should be made in consultation with those who administer the rules, *i.e.*, the overseers and foremen who are the leaders of small sections of the workers. Mr. Rowntree is strongly of the opinion that while the higher officials must be appointed by the directors, these junior officials with whom the workers are constantly brought into contact, and who can make the hours spent at work happy or miserable, should always be selected in consultation with the workers themselves. A representatve of the workers in the departments concerned, usually the shop steward, should be associated with the management in the selection of an overseer.

It is not only in the making of the laws but also in their administration where difficulties arise. Mr. Rowntree suggests that in order to protect people from mal-administration of the laws there should be an impartial tribunal in the form of an appeal committee comprising two members elected by the workers, two appointed by the directors and an agreed chairman. Anyone punished in any way for a breach of the works' rules or for misconduct should have the right to appeal to this committee whose decision should be final.

Mr. Rowntree's view will savour of idealism to many employers, more particularly because of the known idiosyncracies of those who work with their hands. It will obviously be a little difficult to set up any elaborate organisation of this kind in a comparatively small firm of group 2; it may equally be difficult to set up the organisation in a very large firm in this group, but in spite of the obvious difficulties it would appear to be a useful way of inducing true co-operation between capital and labour.

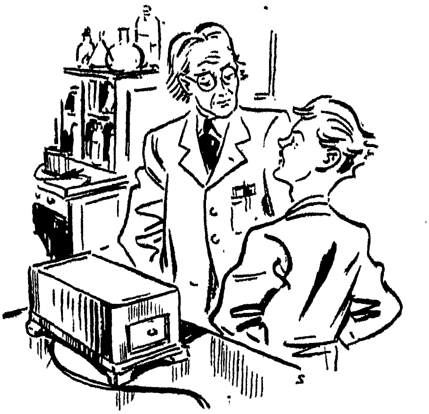
NOTES AND COMMENTS

106—Not Out

THE leadership which this country has given to the world is one of those apparently unpalatable facts which internationally it is now more convenient to forget. Sometimes, however, facts speak more loudly than theories; not the least important of these are the evidences now seeing the light once more of the courage and enterprise of certain chemists and medical men in London in 1841 in forming the Chemical Society of London, which on July 14 as the Chemical Society celebrates the completion of 106 years' service to chemical science in all parts of the world. The fact that the Society is celebrating its centenary six years late is certainly not to its discredit, bearing in mind how fully and honourably most of its members were occupied in 1941; and it is not impossible that some at least of the distinguished scientists who are coming to London next week will recall that without that rallying point in 1841 and again 100 years later the free exchange of information which begins nine days hence would not have been possible. However that may be, next week's celebrations recognise that the impulse which resulted in the formation in 1841 of the first society ever created solely for the study of chemistry is not yet dead and the congregation of chemists from all parts of the world will testify once more to London's continued pre-eminence as a cultural centre which weathers all the storms.

Team Work

IN recent years one has heard a great deal about the value of team work in research. It has become an axiom as obvious as, or possibly even more so than, those of the Euclidean type with which we were quite needlessly troubled at school; for we always found it quite impossible, for example, to produce on paper a point which had no parts. With the cricket season in full swing, team work is now very much to the front in other fields besides research, but it is in the latter that such co-operative effort finds its highest application, especially in the invention of new and improved clothes-pegs which form the subject of a recent patent in which at least four patentees figure. We like to think in this connection that these four are the master minds, able to withstand the fierce glare of publicity their invention may bring on them—but that behind them there are others, the people who did the donkey work, and who merit praise for this important development, but scorn to share in the publicity or renown which must accrue. It has been said, almost *ad nauseam*, that the world makes a beaten track to the abode of him who produces a better mousetrap. It is difficult to assign the relative values of pegs and mousetraps. It is indeed a problem in advanced relativity demanding an Einstein's mathematics and before which even Euclid would have felt dizzy. Mousetraps assist in the conservation of food, although in these days of very limited cheese rations they demand in the eyes of those, like ourselves, who are very fond of cheese, a very high expenditure of that rare luxury especially if, as so often happens, the mouse takes the cheese and absent-mindedly forgets to spring the trap. On the other hand clothes-pegs, if of the new and improved type and skilfully used, are powerful aids in the preservation of our spare and scanty raiment. Our experience in this direction is indeed somewhat limited. We remember having to fight our way from the maudlin embrace of a wet sheet which we were passing when the peg gave way; presumably, the steel spring of the peg became " fatigued."



Professor Peptic: ***How do you know it's a metal?***

Harold: ***Because its hard and shiny and ends in "um."***

On another occasion when we engaged in a new form of laundry research, using soap of our own manufacture, resulting in the complete destruction of the garment owing to excess alkali, pegs were needed in very large numbers for the numerous small pieces of shirt.

Research at Home

REVERTING to the subject of foods and leaving the painful memories of corrosive soap, it is particularly cheering to find, from another recent patent, that marmalade can now be made from seaweed; and not only marmalade, but table jellies as well. This will bring added interest to our forthcoming sojourn at the seaside where, as usual, large supplies of seaweed will be available. It may, however, be necessary to bribe the landlady handsomely for permission to undertake a few experiments with seaweed in her kitchen, backed up by a promise to let her have the very first jar of marmalade produced—a just retribution. But memories of seaside landladies, however—memories which go back many years—tend to weaken any scientific hopes in this direction and to dampen the zeal of the most enterprising researcher. So far as one can remember they objected most strongly to having long strands of slimy seaweed all over the house; and it is doubtful if any of them, even the most kindly, would be pleased to have a large pan of seaweed a-boiling and a-bubbling in the kitchen. They might even object to the smell: even now we can recall the truly amazing odour which came from the botanical laboratory when students had a week with "fresh" red and brown seaweeds. Our landlady might in the end prefer to get her table jellies at the shops. Scientific investigators have to contend with many difficulties and much discouragement.

Work of Art

TRADE and technical literature seems generally to fall into one or other of two fairly well defined categories: the indispensable but unedifying sort of publica- and the more enterprising sort of publication which assumes that the client's interests are not necessarily bounded by specifications, price and trading terms. THE CHEMICAL AGE is the recipient of both sorts on a scale which would seem to controvert stories about the paper shortage, were the facts not so painfully evident to a publisher, and we are grateful when the balance is in favour of the "readable" sort. So as connoisseurs in catalogues and expert trade publication tasters we get from the current Review of Ciba, the international chemical and dyestuffs manufacturers whose headquarters are in Zurich, the sort of glow which the wine-taster probably gets when presented with a very fine vintage of exceptional rarity. All but two of the 42 decorative and absorbing pages of this review are devoted to a scholarly study in great detail of medieval dress and are ornamented with reproductions of contemporary illustrations and sculpture from roughly the ninth to fifteenth centuries preserved in priceless collections on the Continent. It may be asked: How does this promote the business interests of dyestuffs manufacturers, since all reference to the dyer's chemicals, in which Ciba are specialists, are confined to the subsidiary position which other advertisements occupy in a modern newspaper? There is, indeed, no prospect that an immediate increase in sales of Ciba products will result from this very graceful contribution to trade literature; but it is fairly certain that nearly all who receive a copy will prevent it meeting the fate which may overtake most trade booklets after a very short life and will long entertain a very cordial feeling towards Ciba for having produced something which stimulates the imagination and widens the dyer's background as no ordinary technical or trade list does.

Chilean Nitrate of Soda

The Board of Trade states that Chilean nitrate of soda, crystal and granulated, 97/98 per cent, will be sold in lots of 6 tons or more delivered carriage paid to any railway station in Great Britain up to June 30, 1948, at £18 10s. per ton of 2240 lbs. gross weight. Smaller lots delivered carriage paid will be sold at the above price plus the following surcharges: 4 tons and over, but less than 6 tons, 1s. per ton; 2 tons and over, but less than 4 tons, 5s. per ton; 1 ton and over, but less than 2 tons, 10s. per ton; 2 cwts. and over, but less than 1 ton, 20s. per ton. An allowance of 10s. per ton will be made to buyers who collect from port warehouses, in which case there will be no surcharges for lots of less than 6 tons.

Montreal Steel Plant.—Algoma Steel Corporation's plant at Montreal, it is reported, will increase its production to a million tons of steel a year by the end of 1947, thus almost doubling the 1946 figure of 550,000 tons.

CHEMICAL PLANT MANUFACTURERS

ANNUAL LUNCHEON AND MEETING

A DISTINGUISHED gathering of nearly 200 members and guests of the British Chemical Plant Manufacturers' Association were at the annual luncheon of the Association in the Great Hall of the Connaught Rooms, Great Queen Street, London, W.C.2, on Wednesday, June 25, Mr. W. R. Beswick, chairman of the B.C.P.M.A., presided.

The principal guest was Sir Henry Tizard, chairman of the Defence Research Policy Committee.

Other guests included Dr. H. J. T. Ellingham (secretary of the Royal Institute of Chemistry); Sir Charles Goodeve, director of the British Iron and Steel Research Association; Dr. L. A. Jordan, director of the Research Association of the British Paint, Colour and Varnish manufacturers; Dr. J. G. Mallock, of the National Research Council of Canada; Professor D. M. Newitt, Professor of Chemical Engineering, Imperial College; Sir William Palmer, of the British Rayon Federation; Mr. H. V. Potter, president of the Plastics Institute; Sir Archibald Rowlands, permanent secretary to the Ministry of Supply; Sir Ewart Smith, of the Advisory Council on Scientific Policy; Mr. N. Garrod Thomas, director of the National Sulphuric Acid Association; Dr. A. J. V. Underwood, chairman of the Chemical Engineering section of the XIth International Congress of Pure and Applied Chemistry; Mr. M. K. Vellodi, deputy High Commissioner for India; Professor H. Watson, Professor of Chemical Engineering at University College, London; Mr. H. W. Cremer (president) and Mr. M. B. Donald and Mr. L. O. Newton, joint honorary secretaries of the Institution of Chemical Engineers, Mr. E. H. Gilpin, chairman of the British Food Machinery Manufacturers' Association; Mr. A. J. Holden, general manager of the Association of British Chemical Manufacturers; Mr. Eric Boden, scientific liaison officer to the Union of South Africa; and Sir John Henry Woods, permanent secretary to the Board of Trade; as well as representatives of the Ministry of Labour and National Service, the India Office, the Ministry of Supply, the Federation of British Industries, the Ministry of Fuel and Power, and editors of technical journals.

After the Loyal Toast, the Chairman proposed "The Guests," with which toast he coupled the name of Sir Henry Tizard. He accepted the task as a privilege, and said the Association was indeed honoured by the wide and cordial relationships represented on that occasion.

Welcoming the representatives of Government departments, he said his words were of no idle choice when he referred to them as trusted friends with whom discussions were full and oft-times frank. They appreciated that the anxieties of the Association were directed to the development of industry.

The permanent heads of two great State departments were two very welcome guests—Sir John Henry Woods, of the Board of Trade, whose department fostered the commercial activities of industry, and Sir Archibald Rowlands, of the Ministry of Supply. It was also a privilege to welcome representatives of the Department of Overseas Trade and the Ministry of Fuel and Power, with whom the Association was in day-to-day contact.

Mr. W. R. Beswick, chairman of the B.C.P.M.A. at the luncheon.

Next, the chairman welcomed very heartily the representatives of industrial organisations with whom the B.C.P.M.A. had common purpose in smoothing the path of trade, employment and technical development, adjusting the industry to the complex conditions of the times, work which was a guarantee of that stability which everyone so much desired. Among them he mentioned specifically the great Federation of British Industries, the British Engineers' Association, the Tank Association, the Food Machinery Manufacturers, and industrial research associations, which included the British Iron and Steel Research Association (represented by Sir Charles Goodeve), and the British Non-Ferrous Metals Research Association.

There were also present representatives of the Association of British Chemical

Manufacturers and many other friends from the chemical industry. The B.C.P.M.A. was in constant touch with the chemical manufacturers' association, for they were indeed interdependent. One of the things they were trying to do was to eradicate the word "bottleneck"; and the chairman emphasised that the supply of home plant was important. He paid tribute to the statesmanlike attitude of the chemical manufacturing industry in offering to make user experience and "know-how" available for large overseas contracts, which could have a significance in national prestige.

Coupling the toast with the name of Sir Henry Tizard, the Association's principal guest—which afforded him particular pleasure—the chairman said that Sir Henry's name was associated with scientific achievement in many directions, and in the field of research, where his courageous and dynamic personality had been the means of driving many vital developments through to practical results. His was a distinguished association with university life and with Government service, both in peace and war, and he was now chairman of the Advisory Council on Scientific policy and of the Defence Research Policy Committee.

Guests Reponse

Sir Henry Tizard, responding to the toast, first returned thanks for the warm welcome extended to the guests, and particularly for the kind remarks concerning himself, which were extremely encouraging even if they were not deserved. The guests, he said, had enjoyed immensely the Association's hospitality and company.

Commenting on the chairman's reference to his appointment as a guiding hand behind the scientific policy of the country, Sir Henry said that the new Advisory Council on Scientific Policy, and all concerned with it, were determined to do what they could in the national interest. But he asked that not too much should be expected of them—at any rate at first. He doubted that they could be of any really decisive help in overcoming the short-term national difficulties, though they certainly could be of some help. They would be concerned mainly with long-term problems, helping, for instance, to improve the scientific organisation of government, studying and advising on the problem of scientific man-power, watching for shortcomings in technical developments, and generally giving help.

Sir Henry confessed that, although he had started his adult life as a chemist, he had had no idea, until he had had the pleasure of meeting the Association's chairman and director, and subsequently of reading its annual report and one of the special memoranda written for the benefit of members, of the range of its interests and work. He would like to know what countries the director had *not* visited in the course of his duties, and of what language he was too ignorant to order a dinner, or at least a drink!

We lived in difficult times, which would be far more difficult than they were if we were not enjoying the help of friends and relations overseas. Before long we should have to get along without that generous help. Whatever expedients we devised to get us over the first fences, and whatever luck we had in the race against time and circumstances, all would depend in the long run on the quality of our exports, or in other words, on the science and skill they represented. It was difficult to think of any industry which offered more scope in that respect than the chemical industry. Taking it as a whole, there must surely be more science in it, per pound of product, than in the products of other industries. Some chemicals, such as alkali, were now so common, and their manufacture so standardised, that one had almost forgotten that they represented the science of the past. For such products there was a steadily growing world demand, which we ourselves could not possibly satisfy. The best thing we could do in such circumstances was to teach other countries to make them and to export the capital plant for the purpose, and eventually to benefit, directly or indirectly, by their growing prosperity.

Annual Meeting

Sir Henry expressed thanks, on behalf of himself and his fellow guests, for the hospitality extended to them, and with full heart he wished the Association success.

After the luncheon the annual general meeting was held under the chairmanship of Mr. W. R. Beswick. In the annual report it was stated that during the year the whole supply position had deteriorated and much of the time of the Association had been occupied in consultation with the Government on the subject in an endeavour to ease the difficulties of the members.

Throughout the year the Association had been in close touch with the Association of British Chemical Manufacturers and other user organisations, as well as with their members, regarding the re-equipment of the home industries which the British chemical plant industry serves, and in particular, had devoted attention to the incidence of deliveries for home and export orders. From these discussions had developed a spirit of co-operation which it is hoped to foster still further during the coming year.

As was foreshadowed in the last annual report and following representations made to the Government by the B.C.P.M.A., the Institution of Chemical Engineers, the Institute of Petroleum, and the Association of British Chemical Manufacturers, the Ministries of Labour and Education have established centres at Battersea Polytechnic, the South-West Essex Technical College and Loughborough College, at which selected candidates from the forces and from industry are given a minimum of one year's intensive training in chemical engineering; a fourth course is shortly to be instituted at Bradford Technical College. Candidates for these courses are interviewed by a joint selection panel, on which the B.C.P.M.A. is represented by Mr. W. R. Beswick, Mr. C. M. Auty and the secretary. Successful students will be excused from all excepting the home paper of the examination for the associate membership of the Institution of Chemical Engineers. These arrangements, it is hoped, will lead to the recruitment of a considerable number of newly trained entrants to the industry.

The Association had also arranged for members to meet representatives of the educational institutions concerned to discuss the supply of chemical engineering laboratory equipment for the courses.

To provide an opportunity for the chairman, officers and headquarters' staff to meet members in the provinces the first of a series of regional meetings was held in Sheffield on January 15, 1947, when opportunity was taken to entertain regional government officials who also attended a discussion on the stainless steel supply situation which was followed by a visit to the works of Messrs. Firth Vickers Stainless Steels, Ltd. A further regional meeting was held in Bristol on February 13, 1947, and it was hoped to hold the next meeting in Manchester in the autumn.

Throughout the year the executive committee had given special attention to the expansion of the industry's exports and the director had devoted a large proportion of his time to this aspect of the Association's affairs.

The urgent necessity for increasing our exports to the hard currency countries had influenced the executive committee to consider the possibility of arranging for a strong Chemical Engineering Mission to visit Latin America in the near future; if this proves impracticable it is proposed that the director visits these countries as a preliminary to sending a fully representative mission towards the end of 1948.

The proposal to establish a branch of the Association in India has been deferred. The director visited the following countries during the year: India, South Africa, Iceland, Poland, and Germany. A report on the director's visit to Germany will be circulated shortly.

In the course of the year over 1000 overseas inquiries were handled by the office and the fortnightly bulletin was used for giving particulars of those inquiries that could not conveniently be dealt with by communications to individual members.

Mr. H. S. Cheetham (Humphreys & Glasgow, Ltd.), and Dr. E. C. R. Spooner (Sutcliffe Speakman & Co., Ltd.) did not seek re-election to the council. Mr. J. Duncan Campbell and Dr. R. Lessing were elected in their stead. The officers of the Association and members of council are: chairman, Mr. W. R. Beswick (Ashmore, Benson Pease & Co., Ltd.); vice-chairmen: Major V. F. Gloag (Simon-Carves, Ltd.), Mr. A. G. Grant (Whessoe Limited), Mr. B. N. Reavell (Kestner Evaporator & Eng. Co., Ltd.), hon. treasurer, Mr. H. V. Yorke (Bennett, Sons & Shears, Ltd.).

Other members of council: Mr. G. W. Allott (Newton, Chambers & Co., Ltd.), *Mr. B. L. Broadbent (Thos. Broadbent & Sons, Ltd.), *Mr. J. Duncan Campbell (London Aluminium Co., Ltd.), *Dr. G. E. Foxwell, Mr. E. S. Franklin (Torrance & Sons, Ltd.), *Mr. K. Fraser (W. J. Fraser & Co., Ltd.), Mr. J. C. Haithwaite (John Thompson (Dudley), Ltd.), Mr. G. N. Hodson (Hathernware, Ltd.), Mr. W. J. Hooton (S. H. Johnson & Co., Ltd.), *Dr. R. Lessing (Hydronyl Syndicate, Ltd.), *Mr. J. H. G. Monypenny (Brown Bayley's Steel Works, Ltd.), Mr. S. J. Ralph (Aluminium Plant & Vessel Co., Ltd.), *Mr. J. Arthur Reavell (Kestner Evaporator & Eng. Co., Ltd.), Mr. G. W. Riley (Geo. Scott & Son (London), Ltd.), *Dr. R. Seligman (Aluminium Plant & Vessel Co., Ltd.), Mr. S. G. Watson (W. C. Holmes & Co., Ltd.), Mr. W. Wood (International Electrolytic Plant Co., Ltd.), *Mr. J. W. Wright (Cannon Iron Foundries, Ltd.). *Past chairmen of the Association.

Mr. Norman Neville, O.B.E. (director), Dr. E. H. T. Hoblyn, M.B.E. (secretary).

Next Week's Events

MONDAY, JULY 7, to SATURDAY, JULY 12

Royal Institute of Chemistry. St. Andrew's University. "A Symposium on Coal, Petroleum and their Derivatives."

TUESDAY, JULY 8

Parliamentary and Scientific Committee. Committee Room 12, House of Commons, 5 p.m. General committee meeting. Mr. J. E. L. Bailey and Mr. J. Davidson Pratt: "The Future of the Scientific Instrument Industry in this Country with reference to Competition from Germany."

THURSDAY, JULY 10, to SATURDAY, JULY 12

Institute of Physics (Manchester Branch). Manchester University. Summer Conference.

CENTENARY CELEBRATIONS

DETAILED PROGRAMME OF EVENTS

THE Chemical Society has now issued in detail the programme which it has drawn up for the celebration in London, July 14-17, of its completion of 100 years' service to chemical science. The Society is, in fact, 106 years old, but war conditions prevented the celebration of the actual centenary in 1941.

The honour of delivering the Faraday Lecture—the concluding event of the three days' celebrations—has been conferred on Prof. Sir Robert Robinson, president of the Royal Society, and the Prime Minister will be the guest of honour at the centenary dinner. The Government will act as host at a luncheon to overseas visitors and at a garden party for Fellows.

The principal events in the three-day programme are as follow.

Monday, July 14.—09.30: PREVIEW of the Centenary Exhibition. 11.00: OPENING OF THE CENTENARY EXHIBITION by the President of the Society, Prof. C. N. Hinshelwood (in the chair, Mr. G. Tomlinson, Minister of Education), at the Science Museum, South Kensington, S.W.7.

Tuesday, July 15.—09.45: RECEPTION of delegates and distinguished visitors by the President and Council, at Central Hall, Westminster. 11.00: OPENING CEREMONY OF THE CELEBRATIONS; address of welcome by the President; presentation of addresses by distinguished visitors. 03.30: CENTENARY ADDRESS by the President of the Society at Central Hall, Westminster.

Wednesday, July 16.—11.00: LECTURES—(1) "Chemical Personalities a Century Ago," by Prof. J. Read, at the Institution of Civil Engineers, Great George Street, S.W.1; (2) "The Work of the Royal Institution in Physical Chemistry in Great Britain," by Prof. E. K. Rideal, at the Royal Institution, Albemarle Street, W.1. 08.00: (3) THE FARADAY LECTURE, by Sir Robert Robinson, followed by presentation of Faraday Medal to the lecturer, at the Central Hall, Westminster.

CHEMICAL CONGRESS PROGRAMME

Wednesday, July 16.—16.00: Registration of members at South Kensington. 21.30: Informal reception at Dorchester Hotel.

Thursday, July 17.—10.30: Opening ceremony by President of Congress, and opening of XIth Conference de l'Union Internationale de Chimie by the President, at the Central Hall, Westminster. 12.45: Subscription lunch at Holborn Restaurant. 12.45: Subscription lunch at Connaught Rooms. 14.30: Congress lecture by Prof. L. Pauling at the Royal Institution. 15.30: Garden party by H.M. Government at Lancaster House, S.W.1.; reception by Mr. Herbert Morrison (Lord President of the Council). 18.00: Reception by the Royal Institution; reception by Lord Rayleigh. 21.00: Reception by the Royal Society and Sir Robert Robinson in Burlington House.

Friday, July 18.—09.00: Meetings of Sections 1-14 at South Kensington; meeting of Bureau et Comité d'Action, conference, at Burlington House. 10.15: Réunion de l'Assemblee Général, conference, at Burlington House. 10.00: Visit to Kensington Palace and the Victoria and Albert Museum. 11.15: Réunion de Conseil, conference, at Burlington House. 12.45: Luncheon by the Society of Chemical Industry at the Mayfair Hotel. 14.30: Congress lecture by Sir Henry Dale, at London School of Hygiene and Tropical Medicine, Keppel Street, W.C.; visit to Messrs. J. Lyons' laboratories, Hammersmith Road; visit to the research laboratories, General Electric Company, Wembley; visit to Messrs. Phillips' Lamps' laboratories, Mitcham. 15.00: Ladies' fashion display and tea at the Dorchester Hotel; 15.30: First Congress meeting on Abstracting Literature and Documentation. 17.00: Réunion des Commissions, conference, at Burlington House. 19.00: Visit to Adelphi Theatre ("Bless the Bride"); concert by Jacques String Orchestra at Conway Hall, Red Lion Square, W.C.1. 19.30: Invitation dinner given by Lord Leverhulme, President of the Congress, at the Apothecaries' Hall.

Saturday, July 19.—09.00: Meetings of Sections 1-14 at South Kensington; Réunion des Commissions, conference, at Burlington House. 10.00: Day tour by motor coach to Cambridge; day tour by motor coach to Windsor. 14.30: Tour of the bombed area of the City and East End and Dockland; tour of the West End, Westminster Abbey, Houses of Parliament and the Wallace Collection. 15.00: Display by the National Fire Service, at Lambeth. 19.30: Buffet dance by subscription at Grosvenor House. 20.00: Subscription dinner at the Dorchester Hotel.

Sunday, July 20.—10.00: Day tour by motor coach to Oxford via the Thames Valley; day tour in Kent, including Canterbury, Sevenoaks and Maidstone; day tour in Buckinghamshire, including Whipsnade Zoo. 11.00: Religious services.

Monday, July 21.—09.00: Meetings of Sections 1-14 at South Kensington; Réunion des Commissions, conference, at Burlington House. 10.00: Ladies' shopping parties. 11.30: Réunion de l'Assemblee Générale, conference, at Burlington House. 12.45: Invitation luncheon by the Salters' Company in the Ironmongers' Company's Hall. 14.15: Visit to Messrs. Beechams' laboratories, Brockham Park, Dorking. 14.30: Congress lecture by Prof. P. Karrer at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C.; visit to the Royal Botanic Gardens, Kew. 15.30: Congress lecture by Prof. A. Tiselius at the London School of Hygiene and Tropical Medicine, Keppel Street, W.C. 17.00: Visit to the European Service Studios of the B.B.C., Bush House, Aldwych; reception by the Society for Visiting Scientists at 5, Burlington Street, W.1. 21.00: Reception by the President of the Congress and the Lord Mayor of London at the Guildhall.

Tuesday, July 22.—09.00: Meetings of Sections 1-14 at South Kensington; Réunion des Commissions, conference, at Burlington House. 10.00: Visit to the Dairy Research Institute, Shinfield, nr. Reading; visit to Messrs. British Drug Houses Laboratories, Poole, Dorset. 12.45: Luncheon by Imperial Chemical Industries, Ltd., at the Dorchester Hotel; ladies' subscription lunch at the Connaught Rooms. 14.30: Congress lecture by Prof. L. Hackspill, Membre de l'Institut, at the Royal Institution, Albemarle Street. 14.45: Sightseeing tour of City, St. Paul's Cathedral, Tower of London and the Guildhall; tour of Surrey (Reigate and Dorking); visit to Messrs. Tate & Lyle's Laboratories, Silvertown; visit to Messrs. High Duty Alloys' laboratories, Slough; visit to Messrs. J. Lyons' laboratories, Hammersmith Road. 15.30: Second Congress meeting on Abstracting Literature and Documentation. 16.30: Invitation tea party by Mrs. Eric Rideal at the Royal Institute, Albemarle Street, W.1.; invitation tea party by the English Speaking Union at Dartmouth House, London, W.1. 20.30: Reception by the Royal Institution of Chemistry and Dr. E. Roche Lynch at Grosvenor House.

(*continued on page* 12)

Paint Statistics for May

The Paint Advisory Committee of the Board of Trade has issued the following statistics in respect of the May, 1947 distribution of linseed oil, lithopone, titanium dioxide, and drying oils:—

Linseed Oil.

	Tons	Tons
Ad hoc allocations		
Ancillary uses	20	
Crown Agents	30	
Exports under M.O.S.E.S.	125	
Reserve	20	
Retail sales under Building Maintenance Scheme	100	
White lead paste	125	
		420
General distribution total		3,576
Total		3,996

Lithopone.

Paint	2,333	
Special releases	177	
M.O.S.E.S.	156	
		2,666
Non-paint	612	
Direct export	15	
		627
Total		3,293

Titanium Dioxide.

Paint	426	
Special releases	78	
M.O.S.E.S.	47	
		546
Non-paint		244
Total		790

Tung Oil.

	Tons	Cwts.	Total Tons	Total Cwts.
Paint	227	18		
Non-paint	38	5		
			266	3

Dehydrated Castor Oil.

	Tons	Cwts.	Total Tons	Total Cwts.
Paint	125	10½		
Non-paint	111	12		
			237	2½

Oiticica Oil.

	Tons	Cwts.	Total Tons	Total Cwts.
Paint	1	10		
Non-paint	1	8		
			2	18

Stillingia Oil.

	Tons	Cwts.	Total Tons	Total Cwts.
Paint	446	2½		
Non-paint	11	0		
			457	2½

LESS COAL IN JUNE

A SUBSTANTIAL reduction in the amount of deep-mined coal produced in the first two weeks in June is a disturbing feature of the summary which the Ministry of Fuel issued last week. The reduction is in comparison with the relatively high output in May. Total output of saleable deep-mined coal in the week ended June 7 was 3,660,600 tons, and in the following week it was 3,691,200 tons. In the previous two full five-day weeks, May 17 and 24 (May 31 was Whitsun week) the figures were 3,844,100 tons and 3,802,300 tons, respectively. A steady increase is shown in the smaller output of opencast coal for which the figures are: May 17, 209,500 tons; May 24, 227,000; May 31, 159,600; June 7, 212,000; June 14, 238,500 (provisional).

The weekly average loss of coal through holidays, disputes, accidents and transport difficulties was 305,100 tons. Voluntary absenteeism among coal-face workers was halved in the five-day weeks in May, averaging 4.65 per cent, as compared with 10.91 per cent in April. Average output per man-shift was 2.88 tons, compared with 2.77 tons in April.

Two Penicillin Awards

The Royal Society of Medicine has departed from its normal custom of presenting one Gold Medal by awarding one to Sir Alexander Fleming and another to Sir Howard Florey for their co-development of penicillin.

BULK BUYING ATTACKED

REPRESENTATIONS about rising prices in industry, notably in the cost of raw materials, are being made to the Association of Chambers of Commerce by the Birmingham Chamber. At a meeting of the Birmingham body last week Mr. Walter Higgs quoted the increased prices of various metals, including copper, from £63 to £132 per ton, and said that when the present sellers' market was replaced by a buyers' market, manufacturers would be in serious difficulties. He attributed the increases largely to bulk purchasing, a "very inefficient way" of buying overseas, and pointed out that manufacturers were unable to quote firm prices for export owing to continued advances in the price of raw materials. Several instances had been reported to the Chamber where overseas customers had, for this reason, refused to place orders.

Explosion at Chemical Factory

Five persons were injured and four were removed to hospital as the result of an explosion in part of the distillation plant of the W. J. Bush & Co., Ltd. chemical factory at Mitcham on Tuesday. It is understood their injuries were not very serious. The company stated next day that despite the apparent violence of the explosion only a small part of the factory was affected; elsewhere work continued as before, and the damage would be repaired in a week or so.

Synthetic Iron Oxide Pigments*

EACH year thousands of waste iron salt solutions from U.S. steel mills and titanium oxide plants are neutralised and pumped into streams. One small steel plant has to dispose of an iron oxide equivalent of over 125 tons per day. This iron oxide in the form of ferrous sulphate is dissolved in about 125,000 gallons of acidulated water. The proper neutralisation of such waste acid-ferrous sulphate solutions requires much time, labour, and money. Owing to critical stream pollution by chemical wastes, great care has become necessary in the disposal of waste pickle-liquor from the steel mills and titanium oxide plants.

For many years a certain amount of this iron salt solution has been converted to copperas, and ferrous sulphate, by evaporation and crystallisation processes. From these purified solutions iron oxide paint pigments and polishing rouge are made.

Another use of the pure iron oxides resulting from iron pickle liquor that has not received the attention it deserves is the preparation of metallic iron powder from which many useful objects may be made through compression in moulds, sintering in a reducing atmosphere, followed by coin pressing. The full utilisation of this scheme of manufacturing iron parts awaits only the methods of preparation of pure iron oxides at a reasonable cost.

While the synthetic iron oxide pigment industry is one of the oldest U.S. industries, by virtue of its age it is one of the most conservative. The chemical engineers, perhaps on account of its relative size, have neglected the potential importance of the methods used within the industry. It is believed that while these methods are producing good results, there is much room for improvement. For instance, certain of these operations could be streamlined and made continuous instead of batchwise as at present, thus leading the way to an economic use of larger portions of the now valueless pickle liquor.

There is another useful application for finely divided iron oxide. In the ever widening search for petroleum it will become necessary to drill many more and deeper wells involving the use of drilling mud having an apparent density of from nine to twelve or more lb. per gallon. One of the faults of the earlier use of iron oxide for this purpose is that it hydrates readily and plugs up rock structures. However, this drawback can be overcome in several ways.

In another, and completely different sphere this very quality of hydration and sticking to rock structures had a great advantage. Cement blocks can be coloured red, brown, yellow, or blue-grey by appropriately prepared iron oxide. A mixture of such a material not only gives desirable colours but also improves the water proofing qualities of the blocks.

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* From a paper read by C. C. DeWitt before a meeting of the American Institute of Chemical Engineers at St. Louis, Missouri, May 1947.

U.S. Gas and Coke Decline

PRODUCTION of retort coke in the United States in 1946 totalled 753,335 net tons, according to producers' reports received by the Bureau of Mines of the United States Department of the Interior, which reported that in the coal-chemical field a total of 17,464,392 gallons of tar were produced in 1946 and 1,259,469 lb. of ammonium liquor (NH_3 content).

The production of 753,335 tons of retort coke represented a decrease of more than 12 per cent from the 1945 output and continued the downward trend that started in the early twenties. The manufacture of retort coke, dependent on the production of coal gas, declined in recent years principally because of the substitution of water gas, natural gas, or liquefied petroleum gases for coal gas at a number of installations. Conversions were curtailed temporarily during the war years because of shortages of labour and materials but a definite acceleration in conversions was noted in 1946 with one plant changing from the manufacture of coal gas to water gas, four plants to natural gas, and 11 plants to propane-air gas. A total of 174 retorts having an annual coal-carbonising capacity of 57,000 net tons were reported as being abandoned in 1946, and at the end of the year only 1787 retorts were in operation of the 2148 reported in existence. The annual coal-carbonising capacity of all retorts or ovens in existence on December 31, 1946, totalled 1,608,500 net tons and the rate of operation for the year was 77 per cent of the carbonising capacity, according to the Bureau of Mines.

The decline in retort-coke production was accompanied by a decline of 12 per cent in the output of crude tar. The yield of crude coal tar per ton of coal carbonised also dropped from 14.11 gallons in 1945 to 14.08. The recovery of ammonia from coal-gas retorts in the form of ammonia liquor which was practised at 100 plants producing 14,500,000 lb. of ammonia in 1920 has steadily declined and in 1946 only 1,259,469 lb. were produced at four plants.

A River of Chemicals

New Uses for Wood Pulp By-Products

THE problem children of industry are the waste products which result from manufacturing processes. Gradually the applied science of the industrial laboratory is putting these unmanageable offspring to work—observes *C-I-L Oval*, the journal of Canadian Industries, Ltd., introducing an up-to-date review of the large and increasing range of industrial uses now being found for the waste liquor resulting from the chemical production of wood-pulp.

The by-product of this vast Canadian industry at one time " went down the drain." Now it is the raw material for a dozen valuable manufactured products and the range has certainly not yet been exhausted.

For every three cords of wood which entered the cooking digesters of the pulp and paper industry to be converted into chemical pulp by the sulphite process, about eight tons of liquids and solids such as sugars, lime, lignin, acetic acid and sulphur, together with the cooking chemicals, were formerly washed away. This does not apply, of course, to the mechanical pulp process, which accounts for two-thirds of all the pulp made in Canada, since by this process, virtually all the wood is converted into pulp.

Digested Products

In the chemical process the log is reduced to its component chemicals in large digesters in which it is cooked in an acid solution for six to 12 hours under pressure at around 135-145°C. The solution is of magnesium or calcium bisulphite in sulphurous acid, which releases from the wood about 50 per cent of recoverable cellulose and the large content of lignin, which binds the fibres together. Sugars, resins and fats are also released.

The cooking liquor dissolves virtually all the components in the wood save the cellulose which emerges as pulp having a weight around 48 per cent of the original wood. The residue from the cooking process is shown in the following typical analysis, given in grams per litre:

Total solids	120.25
Residue on ignition ...	19.45
Total sulphur	10.95
Calcium	5.34
Lignin	61.90
Hexoses	17.50
Pentoses	2.32
Furfural	0.26
Acetone	0.13
Ethanol	0.18
Methanol	1.03
Acetic acid	4.70
Formic acid	0.93

One of the earliest uses of the sulphite liquor was as a soil stabiliser, in which it was comparable to calcium chloride, and it did good service in the war for aircraft runways, which remained firm even after heavy rains. Some of the liquor is still being concentrated to 50 per cent solids and sold for road surfacing and as a binder for sand moulds, linoleum and fuel briquettes.

Source of Alcohol

The war stimulated one of the more important uses of the liquor—as a source of fermentable liquors and hence of alcohol for fuel and synthetic rubber production. When the need arises, the Canadian pulp and paper industry, with a potential production capacity of 30 million gallons of industrial alcohol a year, will be able to take care of domestic demand and perhaps serve the export market.

In Canada two plants are making yeast from sulphite liquor, but the potential capacity for producing yeast is so great that one fair-sized sulphite mill could supply the whole Dominion. Another contribution to foodstuffs is vanillin, the essential aromatic of vanilla, of which the two mills in Canada and the U.S.A. could, if necessary, step up production to vast proportions.

The production of celluloid, the first plastic, from cellulose nitrated with a mixture of nitric and sulphuric acid and plasticising with ether-alcohol and camphor dates from the latter half of the nineteenth century. Now the lignin, nature's own plastic cement is likely to be a more economical source of plastics. Wartime research by the Howard Smith Paper Mills at the request of the Canadian Government produced a method to isolate lignin in a relatively pure form from the waste liquors of the alkaline pulping process. The lignin is produced as a fine brown powder. This is mixed with kraft pulp of other pulp making fibres in a papermakers' beater, and then run over a conventional papermaking machine. The retention of the lignin is some 40-45 per cent.

Lignin Impregnation

The lignin-enriched paper is then made up into piles, placed between polished steel plates and inserted in a hydraulic press where it is subjected to a pressure of 800 lb. per sq. in., and heated to around 160°C. The heat and pressure cause the lignin to melt. On cooling the individual sheets are found to be fused into a single, homogeneous sheet material having great impact strength and impervious to mild alkalis, acids, alcohols and ordinary solvents and having high di-electric properties.

A war-time development in England was the use of sulphite liquor as a source of glycerine, needed in the manufacture of explosives. Using the proper strain of yeast, yields of glycerine up to 35 per cent of the weight of the sugar were obtained. Toluene was produced in Germany by the hydrogenation of sulphite liquor.

The presence of sugar in the liquor promoted its successful use in Europe to relieve the protein scarcity and in Germany protein from sulphite liquor even served as a meat substitute. A more promising experiment is the production of an elastic substance with properties similar to rubber by treating sulphite liquor with hydrogen peroxide and recovering the precipitate, which is hydrolysed and polymerised.

All these uses, however, by no means exhaust the potentialities of this versatile by-product, of which its suitability as fuel is not the least. In localities where coal is costly the concentrated liquor, the organic materials of which have a fuel value of 8500 B.Th.U., is used for fuel. One mill in the United States and at least one in Canada are to use a magnesium instead of calcium base cooking acid and the concentrated sulphite liquor will be burned in furnaces in order to reduce coal consumption and to recover the chemicals.

In Canada alone, almost 1,[illegible]00,000 tons of solids of various kinds from sulphite liquor are available annually. Although a large number of products can be produced from this river of chemicals, the problem now is to produce them at an economic cost. The outlook is bright, and developments are expected.

KODAK RESEARCH

In the course of an address to a meeting of the Royal Society at Burlington House, Piccadilly, on July 3, Dr. C. E. K. Mees, vice-president and director of research of Eastman Kodak research organisation, referred to his company's "sensitising dyes," which he explained had been successfully developed as a result of the research organisation's activities. He strongly advocated scientists being allowed to develop their work according to their own ideas, citing as an instance of success in that respect the experiments on the distillation of animal oils under high vacuums, which eventually led to the production of Vitamin A from shark's liver.

Dr. C. E. K. Mees

H.R.H. Princess Elizabeth was formally admitted to membership of the Royal Society on Thursday this week.

ANGAUR PHOSPHATE

Deposits of phosphate rock on the Island of Angaur (300 miles north of New Guinea) which are now being worked by the Japanese on authority from General MacArthur, have been made a subject of protest by the Government of Australia, which feels that the decision to allow operations to begin ought not to have been taken without consultation with the other allied Powers. A spokesman of the British Foreign Office is understood to have made a statement in support of the Commonwealth Government.

By way of answer to these representations, Allied Headquarters in Tokio have now issued a statement to the effect that the Angaur project in no way concerns the British or Commonwealth Governments since the island was captured by U.S. Forces and is under U.S. Control. The statement adds that there is no question as to the propriety of the United States using this to help Japan.

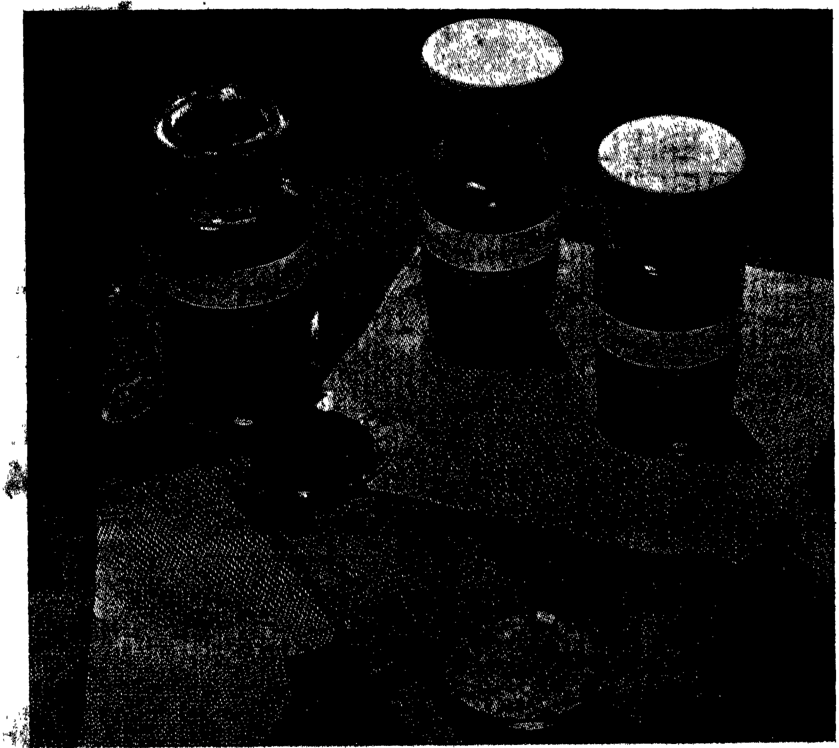
(*continued from page 8*)

Wednesday, July 23.—09.00 : Meetings of Sections 1-14 at South Kensington; final Réunion de Conseil (Elections) conference, at Burlington House. 09.15 : Day visit to the Plastics Division of Imperial Chemical Industries, Ltd., at Welwyn, Herts. 09.30 : Visit to Royal Horticultural Society's Gardens, Wisley, Surrey. 14.00 : Congress lecture by Prof. B. C. T. Jansen at the London School of Hygiene and Tropical Medicine. 15.14 : Visit to Rothamsted Experimental Station, Harpenden, Herts.; visit to Messrs. Roche Products' laboratories, Welwyn, Herts. ; visit to Paint Research Station, Teddington, Middlesex; visit to Messrs. Metal Box, Acton; visit to Messrs. Glaxo's laboratories, Greenford, Middlesex; visit to Messrs. J. Lyons' laboratories, Hammersmith Road, W.14. 14.30 : Sightseeing tour of London (British Museum, National Gallery and the Temple). 15.00 : Meetings of Sections 1-14 at South Kensington. 15.30 : Réunion de Bureau de 1947-51, conference, at Burlington House. 19.30 : Gala dinner at Dorchester Hotel; buffet and dance at Grosvenor House.

Thursday, July 24.—10.30 : Closing session of the congress; lecture by Sir Robert Robinson, President of the Royal Society, at the Central Hall, Westminster.

Metallurgical Section

Published the first Saturday in the month



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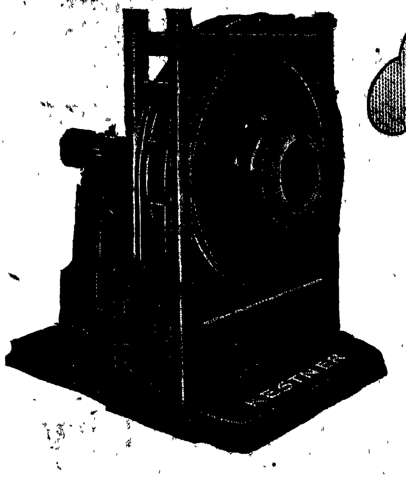

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Metallurgical Section

5 July 1947

PRECIPITATION HARDENING—IV*

by L. SANDERSON

WHEN duralumin has been subjected to mechanical working while in the cold condition it is advisable to anneal it afterwards so as to develop maximum stable ductility in the alloy. The best annealing treatment is to heat the alloy to a temperature of 350°C., hold at temperature long enough for the heat to penetrate right through to the centre of the piece, and cool in air. No ill effects will result from a protracted annealing temperature maintenance period.

For solution treatment, the alloy is heated to a temperature within the range 480° to 500°C. and maintained at this temperature for a period of about 60 min. Duralumin does not exhibit a sharp arrest point, as does steel, so that there is not the same reason for a drastic quenching operation. Oil quenching may, therefore, be safely employed, and is advisable because warping is thereby minimised.

Aging Treatment

The aging treatment depends on whether quick aging is required or whether time is less important. For normal aging, a period of 24 hours is sufficient to produce good results. Heating to a higher temperature will, however, age the material much more rapidly and develop the best possible properties. Duralumin being stable is not one of the alloys that age of their own accord.

When duralumin is artificially aged, it develops a greater elongation percentage, becomes more flexible, and is more adapted to cold working, while there is a higher resistance to corrosion. In addition, there is an appreciable increase in ultimate tensile strength. A point of interest is that duralumin develops oxide tints when heated in somewhat the same way as steel, and while the correspondence between these "temper colours" and the furnace temperatures is not so close as with steel, it is possible to form a rough comparison between them.

There is a method whereby duralumin after it has been quenched can be retained in a mild and ductile condition. This applies also to other alloys of aluminium. The advantage is that the quenched materials are then in a condition in which they can be kept in stock until their employment is necessary, instead of having to be put to use at once. The method consists of maintaining the material at a temperature below that of the atmosphere, which delays normal aging. Rivets and other parts have been water-quenched, washed in alcohol to obviate adhesion of the rivets or parts, and stored in paraffin at a temperature of about − 17°C., the temperature being held at this point by means of dry ice.

It is possible to cool the alloy at a regulated speed so as to inhibit ordinary precipitation of the constituents that produce a hardening effect, while not maintaining the soft solid solution typical of alloys subjected to swifter cooling, and this is said to develop effects comparable to those of aging, without any other effect on the material.

Alloying with Manganese

A development in the use of the aluminium alloys is the employment of alloys containing magnesium and silicon with a base of aluminium for electrical conduction. Such alloys have a typical composition of 0.55 per cent silicon, 0.6 per cent magnesium, 0.4 per cent manganese, 0.3 per cent iron, the balance being aluminium. These have a conductivity about four-fifths that of pure aluminimum. The inclusion of manganese in the composition has the effect of lowering the conductivity, but on the other hand it keeps the grain size small and minimises corrosion, so that its presence is on the whole advantageous.

The precipitation hardened magnesium alloys are rapidly establishing themselves as competitors of the aluminium alloys, and are employable in the form of die castings, sand castings, extruded parts, and forgings, but up to now they have not been used to any great extent in sheet form. The best known and most widely employed alloys of this type are the magnesium aluminium alloys, which contain about 10 per cent of aluminium. In these, the precipitation hardening constituent is Mg_3Al_2 and precipitation is not continuous. A typical composition for this group is 6 per cent aluminium, 0.3 per cent manganese, 3.0 per cent zinc, and a trace of silicon, the balance being magnesium. The ultimate tensile strength of the magnesium alloys ranges from 9 to 28 tons per sq. in., elongation from 11 to 1 per cent, according to the condition. Forgings that have been solution-treated and aged have the highest tensile strength and an elongation range of from 5 to 1 per cent. Sand-cast magnesium alloys have a tensile strength of only 9 to 12 tons per sq. in. and an elongation range of 7 to 2 per cent.

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* Previous articles appeared on February 1, April 5 and June 7.

Copper base alloys can be precipitation hardened; but from the industrial point of view the only ones that matter in this respect are the alloys of copper and beryllium, commonly termed beryllium bronzes, in whose composition is about 2½ per cent of beryllium, with the addition on occasion of percentages of cobalt and silver, introduced to minimise the beryllium content (and therefore the cost). The beryllium content must not exceed 2½ per cent or the alloy will be practically unworkable, while if the beryllium falls below 1 per cent precipitation hardening is not obtained.

These beryllium bronzes are sensitive to heat treatment, and can be given an ultimate tensile strength of about 42 tons per sq. in. by judicious heat treatment, while an alloy containing 1½ per cent beryllium after being aged and mechanically worked in the cold state has been found to have an ultimate tensile strength of about 85 tons per sq. in.

Alloys of this type are normally solution treated at 800°C., and in the aged state are capable of withstanding a good degree of heat and wear, while they are hard and tenacious. Their electrical conductivity is from a third to a half as high as that of copper.

Alloys of copper and silicon or copper and zinc are capable of being precipitation hardened to a slight extent.

Ternary Alloys

Hitherto the alloys of copper dealt with are of binary type. When we turn to the ternary alloys, it is found that there are various copper alloys capable of being precipitation hardened. Among these are copper-nickel-silicon, copper-nickel-aluminium, copper-silicon-manganese, copper-nickel-tin, copper-chromium-silver, and copper-nickel-phosphorus alloys. The alloying elements that have to be introduced into the composition of the alloys to render them capable of precipitation hardening are nickel, cobalt or silicon and aluminium. To make the material sensitive to this form of heat treatment, one or other of these alloying elements must be included.

The copper-nickel-silicon alloys are quenched from a temperature of 900°C., which gives them a hardness of about 60 V.P.N. After an aging treatment at about 400°C., they acquire a hardness of about 180 V.P.N. by reason of the precipitation of Ni_2Si. The copper-nickel-aluminium alloys are of some industrial importance, and for the best results it is essential that the proportion of nickel to aluminium should be about 4 to 1. There must be a minimum of 0.5 per cent aluminium present, but if the aluminium content exceeds 3 per cent difficulty will be experienced in cold working. The best results appear to be obtained with a composition of about 2 per cent aluminium, 8 per cent nickel and 90 per cent copper.

Precipitation hardening of these alloys is achieved by heating them to a temperature of about 900°C., quenching in water, and tempering at about 400° to 600°C. for a period of two hours. This causes the discontinuous precipitation of Ni_3Al, and NiAl (a point not absolutely certain), which produces the hardening effect.

Increasing Industrial Use

Alloys of copper-nickel-tin are of increasing value industrially, and for the best results should contain about 6 per cent tin and 6 per cent nickel, which will produce an alloy having an ultimate tensile strength of about 45 tons per sq. in., a yield point of about 37 tons per sq. in., a limit of proportionality of about 27 tons per sq. in., and an elongation of 10 per cent, with a Brinell hardness number of 200.

Alloys of copper-chromium-silver are usually heated to a temperature of about 1000°C., quenched, and tempered at 450°C. for a period ranging from 16 to 24 hr.; the result is a reasonably corrosion-resistant alloy capable of conducting heat and electricity.

The remaining ternary precipitation hardening copper alloys are of little industrial significance.

The precipitation hardening of iron and steel, commonly termed "aging," occurs spontaneously at room or slightly elevated temperatures when the steel has been given its concluding heat treatment, or has been subjected for the last time to mechanical working while in the cold state. At room temperature, aging of these materials is gradual, but the higher the temperature rises, the more rapid the aging. The effect of aging may be greater hardness and strength, a reduction in ductility and ability to resist impact, the recurrence of a well-defined yield point in the smooth stress-strain curve of slightly cold-worked steel, and corresponding modifications of other characteristics.

Aging in steel seems to exhibit three specific forms: (a) loss of toughness resulting from deformation within the blue heat range. This is usually known as blue brittleness; (b) a form known as strain aging, indicated by the modification of mechanical properties occurring when steel that has been plastically deformed at normal temperature or has been heated after plastic deformation to a fairly low temperature is stored; (c) a form known as quench aging, occurring when steel of low carbon content, and dead mild, has been severely quenched and is stored at normal temperature.

The elements that can develop precipitation hardening in steel are carbon, oxygen and nitrogen. It is possible for silicon and phosphorus to produce precipitation hardening, but not in the percentages in which they are normally present in steel. Manganese and sulphur are of little significance from this point of view. Of the three principal hardening elements enumerated, oxygen appears to be ineffective in producing quench aging unless carbon and nitrogen are present, but does produce strain aging. In stating this it is assumed that the oxygen content of the steel is not excessive.

Little is understood as yet concerning the manner in which strain aging is produced, but it appears to be fairly well established that this form of aging is developed solely by oxygen, or at all events by its influence on the strain-aging produced by carbon and nitrogen. Quench aging, however, is unquestionably the result of carbide precipitation.

Within the temperature range at which blue brittleness occurs (100°-300° C.), aging does not occur at a rapid rate, and this is seen from the stress strain curve of mild steel within this range, which is irregular by reason of the swift changes in load during deformation. The reason for this is that plastic deformation takes place on a particular series of slip planes. The sharp yielding releases the support provided by the tensile testpiece. The load declines for a moment, after which aging, which must occur virtually at once, raises the resistance to additional slip on that particular series of slip planes. The load then increases to a greater value in advance of a further yield by a fresh series of slip planes. We thus obtain quick changes of load necessary to maintain the deformation, with an irregular stress-strain curve in consequence.

When steel is strained, a modification in properties may occur as a result of mechanical working while cold. Other changes that may be produced are precipitation or dispersion of another phase as a result of the plastic strain. This last is the true strain aging, and is normally measured as a variation in hardness or impact value taken in conjunction with time after hardening. The theory favoured at the moment is that plastic strain sets up local supersaturation along slip planes, followed by precipitation. It is, however, reasonable to believe that a little precipitation may arise during straining, and this is suggested by the fact that non-aging steels do not increase in hardness so rapidly as steels capable of aging.

Strain aging normally produces a smaller hardness increase than quench aging, but makes the steel more brittle. The steels most sensitive to strain aging are those of large grain size. Strain aging results in the re-establishment of the yield point elongation step to the smooth stress-strain curve for mild steel that has been subjected to mechanical working while cold. It is this that leads to the development of stretcher strains in deep-drawn steel, which can only be eliminated by immediate use of the temper-rolled sheet as soon as it comes from the mill. If this is done, there will be no time for the material to have its yield point re-established by aging. Alternatively, a non-aging steel can be employed.

The concluding section will deal mainly with the quench aging of steel and hardening in alloy steels.

Czechoslovakian Mining Industry

CZECHOSLOVAKIA'S output of coal, iron and steel is rising and may reach pre-war levels under the present two-year coal plan. The country's deep-mined coal in 1937 totalled 16.79 million tons and in 1946 had reached 14.15 million tons. It is estimated that this year the total will reach 16.27 million tons and brown coal (19.42 million tons) and lignite have already reached higher levels of production than before the war.

The rise in pig-iron and steel production in Czechoslovakia is a second important target in the two-year-plan. Pig-iron production amounted to 1.67 million tons in 1937 and reached only 961,000 tons in 1946. It is planned to bring the Czechoslovak pig-iron production to 1.34 million tons in the current year—about 40 per cent more than in the last year. Steel production diminished from 2.32 million tons in 1937 to 1.67 tons in 1946, and is expected to reach 2.2 million tons in the current year.

Malaya's Tin and Rubber

A memorandum circulated by Malayan Tin Dredging and Southern Malayan Tin Dredging, draws the attention of stockholders and M.P.s to the importance of the tin and rubber industries of Malaya not only to that country's economy, but because they are the greatest source of dollar exchange in the British Empire. The main subject of the circular seems to be the urgent necessity of rehabilitating the industries of the area. War losses in Southern Malaya are said to amount to £1½ millions.

Oxygen for Carbon Reduction in Open Hearths

From Our New York Correspondent

A NEW method of using oxygen to speed the refining of steel in the open hearth and so increase tonnage output by 25 per cent was described by F. B. Lounsberry, vice-president of the Allegheny Ludlum Steel Corp., and G. V. Slottman, manager, of the Technical Sales Division, Air Reduction Sales Co., at a special panel discussion conducted by the American Iron and Steel Institute at the Hotel Pierre, New York, recently, in connection with the Institute's annual meeting.

Oxygen has always played a vital rôle in steelmaking because it combines with carbon and other elements in the molten metal during its refining in the open hearth. But the oxygen hitherto has been obtained from the air in the flame over the molten bath and considerable time elapsed before the oxygen penetrated the slag and metal. Furthermore, the concentration of the oxygen has been limited to that of its concentration in the air.

Introduction of Oxygen

Both Mr. Lounsberry and Mr. Slottman developed a method of introducing oxygen gas, rather than air, through a pipe below the surface of the molten metal. In this manner they delivered the concentrated gas directly and rapidly to a zone which normally receives little oxygen. The introduced oxygen first combines with molten iron to form ferrous oxide. This compound transfers the oxygen to the carbon and other elements which are to be removed from the molten iron, thereby aiding its refining into steel. After completing a series of open hearth experimental heats, it was found that the injecting of gaseous oxygen directly into the bath speeded the removal of the carbon so rapidly that 25 per cent more steel could be refined as against the conventional open hearth steelmaking practices. It was found that the decreased time of making the steel did not affect its quality.

The rate of oxygen supply to the bath varied from 27 lb. (330 cu. ft.) to 62 lb. (810 cu. ft.) per minute. The experimental heats were made in a 90-ton furnace at Allegheny Ludlum Steel Corporation's plant at Brackenridge, Pennsylvania. The furnace operated on all cold charges with baths melting at 0.3-0.6 per cent carbon. Refining was formerly done under highly oxidising slags to produce steels of 0.02-0.03 per cent carbon content. In the experimental heats the charges consisted of 85,000 lb. of basic pig iron, 93,000 lb. of Grade A open hearth rolled scrap, 22,000 lb. of silicon steel scrap, and 16,500 lb. of limestone. No ore was added either in the charge or during the heat, and the only addition made was small quantities of fluorspar. At the end of the lime boil, oxygen was added to the bath through a one-inch diameter pipe at various constant rates of flow. Analyses were made of the carbon, manganese, phosphorus and sulphur content of the bath at suitable intervals during the oxygen "blow" and corresponding slag samples were taken and analysed for FeO, Fe_2O_3, CaO, SiO_2, MnO, MgO, P_2O_5 and Al_2O_3. Additional heats were made using two pipes to supply oxygen simultaneously to the molten bath.

At another panel discussion, dealing with the problems of raw materials, Carl A. Ilgenfritz, vice-president, purchases, U.S. Steel Corp., Pittsburgh, Pennsylvania, reported on the world situation on coating materials. The position of the United States is critical in the three important coating metals, lead, zinc, and tin, according to Mr. Ilgenfritz, who offered a world-wide review of the economic aspects of these metals. Mr. Ilgenfritz pointed out that the steady decline of domestic lead output in the United States in recent years in the face of rising consumption has made the United States increasingly dependent upon imports, and accounts for the present extremely critical position of this metal. Since the entire lead output of Silesia and Jugoslavia now goes to Russia, the requirements of Western Europe have been shifted to Australia and the Western Hemisphere, resulting in sharply reduced lead shipments to the United States from Mexico, Canada, Peru, and Australia.

Zinc supplies are tight and will remain so as long as domestic consumption remains high, and higher prices abroad continue to attract Mexican zinc which is normally shipped to the United States. With this year's tin production estimated at 50 per cent of the pre-war rate, a good world-wide supply of the metal is not likely until 1950. Meanwhile, world tin stocks are being drawn down, despite restrictions on the uses of this metal.

Mond Nickel Fellowship

The Mond Nickel Co., Ltd., has announced its intention of awarding fellowships to selected British candidates of university or comparable educational standards. Successful aspirants will be trained in industrial establishments. The fellowships which will carry no age restrictions, will be five in number, tenable for a year, and worth £750. In certain special circumstances, university training may be awarded.

TENSILE STRENGTH OF METALS

Why Theory and Practice Conflict

Marked distortion of the atomic arrangement has been found to be one of the important factors determining the tensile strength of metals, and that condition can be produced by artficial means, such as cold-working, alloying, age- or quench-hardening. This was one of the points to which attention was drawn by Sir Edward Appleton, secretary of the Department of Scientific and Industrial Research, delivering the Edward William's lecture to the Institute of British Foundrymen in Nottingham last week. He reviewed several of the fundamental problems which metallurgists have lately been studying and noted a number of important advances recently made to adapt metals, or produce new ones, to serve special purposes.

No Perfect Crystal

Of tensile strength, Sir Edward noted that it was not commonly found in simple metallic states. In order to explain the fact that real single crystals are far weaker than the ideal single crystals imagined by the theoretical physicist, it had been suggested that no real single crystals are ever perfect over other than very limited regions.

It was thought that there are in crystals numerous small faults where the crystal structure has got out of joint or out of step. A two-dimensional analogy is that instead of a row of atoms being directly opposite another row of atoms, one of the rows has one atom too many. The sliding of one plane in the crystal over another might be due to the progressive movement of the dislocations step by step across the crystal.

This produced the same effect as simultaneous sliding of the whole plane, although at any one moment only a relatively small number of atoms is moving, and in consequence, the force required to produce shear is seen to be much less than would be necessary if the crystal were really perfect.

This brought us to the problem of why polycrystalline crystals are so much stronger than single crystals. It seemed as if the extra strength of the polycrystalline material must be due in some way to the boundaries between the crystals. At these boundaries the atomic arrangement must be disturbed over a region a few atoms thick so that when yield occurs in a crystal and a dislocation arrives at a crystal boundary it is unable to cross the disturbed region and is dissipated.

An initial internal slip in a small crystal in a polycrystalline material was thus seen to be confined to the crystal in which it started and unless such slips occurred in many crystals simultaneously no plastic yield took place in the material as a whole.

On this theory it followed that if the number of crystals per unit volume was increased, either by the effect of cold working or by the introduction of alien atoms between the crystals, *i.e.*, by the formation of an alloy, the propagation of dislocations was impeded, which meant that the metal became stronger.

As Professor Andrade put it: "When a woman makes a cut in the edge of a piece of cloth and tears it, the tear will only run so long as the cloth is uniform; it will be stopped by a button-hole or a join between two pieces of cloth. In particular you cannot tear a patchwork quilt in that way."

MORE COAL FOR STEEL

INCREASED ALLOCATIONS PENDING

Increased allocations of an unspecified quantity of coal and coke for iron and steel production were announced by Mr. Herbert Morrison in the House of Commons last week. The steel shortage, he said, had been threatening to replace the coal shortage as the most vexatious and crippling bottleneck. Increased coal and coke allocations were being made with the object of giving the industry something like its full requirements during the summer.

They expected that in the summer months the industry would be able to produce at about the same rate as over the whole of 1946—about 12,700,000 ingot tons a year. In the last quarter of the year, they hoped to push production up to a rate of well over 13,000,000 ingot tons a year.

After a warning that with the uncertainty of the coal position the increased allocations were a venture of faith, Mr. Morrison pointed out even maximum home steel production was not sufficient to meet the unprecedented demands, while imports could do little to supply our deficiency.

Simon-Carves, Ltd., of Cheadle Heath, Stockport, will soon begin on a £1,000,000 contract for the constructon of a coke-oven and by-products plant for the Guest, Keen, Baldwin Iron and Steel Company, of Margam, South Wales. Another £500,000 contract has been placed with the Simon-Carves boiler department. This is for the construction of four water-tube boilers, each of which will generate 87,000 lb. of steam per hour.

"Industrial Wales" Exhibition

THE Wales and Monmouthshire Exhibition, to be held at Olympia from August 28 to September 13, is being promoted by the Industrial Association of Wales and Monmouthshire, whose president is Sir Gerald Bruce. Organiser and manager is Mr. B. M. Bellasis, whose office is at 3 Castle Street, Cardiff. Exhibitors already number over 100, heavy industries being represented by coal, steel, tinplate, chemical, quarrying and shipping interests.

Among the names appearing in the first two lists are the following: The Welsh Plate and Sheet Manufacturers' Association, National Oil Refineries, Ltd., Elephant Chemical Co., Ltd., Monsanto Chemicals, Ltd., Whitehead Iron and Steel Co., Ltd., R. Graesser, Ltd., and Metal Box Co., Ltd.

Among the exhibits that Thos. W. Ward, Ltd., will have on show at the Foundry Trades Exhibition at Olympia from August 28 to September 13, are the following: Foundry plant, furnaces, driers, mixers, screens, mixer-millers, sand conditioning plant, ladles, and miscellaneous foundry supplies. The pig irons will include foundry, forge, basic, hematite, low phosphorus and refined varieties. There will be a range of foundry cokes and moulding sand, together with ganisters, limestone, fluor spar, refractories, cinder, millscale, etc.

New Metal-Plating Process

AT a meeting of the American Electroplaters' Society held in Pittsburgh recently, George W. Jernstedt, manager of electroplating projects for the Westinghouse Electric Corporation, described a new plating process which flows metal atoms from solution on to an object, and then smooths and polishes them with an "electrical backstroke." The new method, he says, is better, faster, and less expensive than former methods, one manufacturer having been able to reduce the cost of plating a specific item by 50 per cent, with the added advantage of enhanced corrosion resistance.

According to Mr. Jernstedt the process produces a plate that is considerably smoother than the surface of the material to which it is applied, and by plating and deplating in a cycle, it is possible to obtain a plate of almost any desired thickness. Cyanide type baths such as copper, silver, zinc, cadmium, or even gold ore, he says, are best suited to the process.

Metallurgical Research and Training

CYRIL S. SMITH, director of the Institute for the Study of Metals, University of Chicago, has discussed the trends in metallurgical research and the training of metallurgists for the steel industry, in a paper which he read at the 55th general meeting of the American Iron and Steel Institute. New properties, he declared, could be achieved by the manufacture of new compositions, and the development of the science of metallography, the use of X-ray diffraction to study structure having particularly attractive potentialities.

The treatment of metals is known to be equally as important as its composition, and specifications of structure are frequently included. Most important of all, however, is the necessity of knowing the property actually required in service. But it is in the realm of physics that Mr. Smith believes radically new steps will be taken and really new materials appear. Mere empirical experimentation is much less likely to produce new discoveries than results from theoretical concepts backed by experiment.

Crosfield-Calthrop Combine?

A £250,000 deal which would lead to their amalgamation is being negotiated between two well-known Liverpool firms, Crosfields Oil & Cake Co., Ltd., and Calthrops, Ltd. Crosfields have offered to purchase the 400,000 ordinary 10s. shares of Calthrops at 12s. 6d. each, and a conditional agreement has been reached with the directors, who are recommending the shareholders to accept. The name of the new company would be Crosfields & Calthrop, Ltd.

Under the conditional agreement the purchasers have agreed to pay £16,000 to two whole-time directors and other employees of the company who will lose their employment. They have also agreed to continue to pay small pensions to four elderly work people for the rest of their lives.

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Glass in the Laboratory—III

Draughtsmanship in Laboratory Glassware

by I. C. P. SMITH, B.Sc., F.R.I.C.

IF the average chemist is asked to sit down and make a drawing of a piece of his apparatus, he will either decline and say that he is no artist, or else he will make a drawing from which several important details are omitted. If he is asked to draw a familiar apparatus such as a Soxhlet extractor from memory, giving essential dimensions, the result would in most cases be unrecognisable; he will add, however, in all confidence, that the glass-blower would know what to make.

To many chemists the knowledge of apparatus is a prime essential to his craft, and it is in this matter of drawing, where the training of a chemist differs so greatly from that of an engineer. The latter, no matter what his particular field of work, always includes machine drawing as a part of his curriculum, and it is found that it is by no means necessary for a person to be an "artist" in order to exhibit ability in draughtsmanship.

Useful Training

When certain simple principles in drawing an article are laid down and followed, the art side of the question is found to look after itself, and anyone who can use the simple implements of the draughtsman can make a sound working representation of a given article. In this respect it is usually found that a draughtsman trained on the engineering side will very quickly be able to take up glassware drawing owing to his analytical approach to the subject. He soon understands the way one tube joins into another, in short "the way it is made." The chemist who can make a good working drawing of a required apparatus is at a great advantage, because glass-blowers are not infallible in knowing what to make from a rough sketch; moreover many glass-blowing shops themselves lack proper drawing facilities; and for the apparatus they make, they frequently rely on old patterns which they copy.

In approaching the study of apparatus drawing the chemist has generally a simpler problem than the engineer, as in the majority of instances an elevation employing a single line to represent the glass wall is adequate to depict an apparatus, instead of the plan, elevation, and end view and all the consequent codes of practice required by the engineer. The drawings of standard glass apparatus now being prepared by the Technical Committee of the British Laboratory Ware Association are excellent examples of glassware drawing; specimens of these are shown in Figs. 1 and 2C. They employ the thick line which represents the thickness of the glass in section as being the simplest and the boldest method for use in works. The significance of the line thickness is somewhat lost in these necessarily small reproductions of the originals.

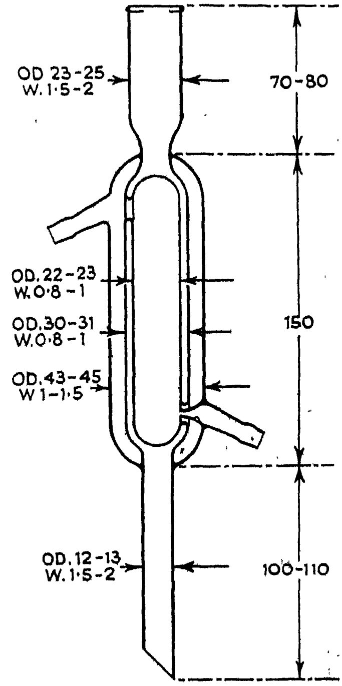

Fig. 1.

For most purposes, as remarked above, a thin line representing the outside surface of the glass only is adequate, and requires much less skill in the drawing than the broad ink line in the B.L.W.A. drawings; moreover, it "looks right." The line represents the glass tubing of average wall thickness from which most apparatus is constructed. The stage reached in Fig. 2B approximately conforms to this style. It is, however, habitual to emphasise capillary tubing by drawing its inside wall, preferably as a full line, not a dotted line, as the bore is actually seen.

For the benefit of those who have no experience in draughtsmanship, Figs. 2A, B, and C, show the stages in constructing one of the B.L.W.A. drawings, putting in the dimensions as they are taken and employed in making the drawing. In the final drawing, joins have been given the shapes they assume in the blow-pipe, and the necessary dimension lines are added with tolerances for length, diameter and wall thickness, the last two being such as are necessary in selecting glass tubing; and it is on these points in particular where considerable care and thought must be exercised by the person making the drawing both in order to obtain a good article and for the benefit of the glass-blower.

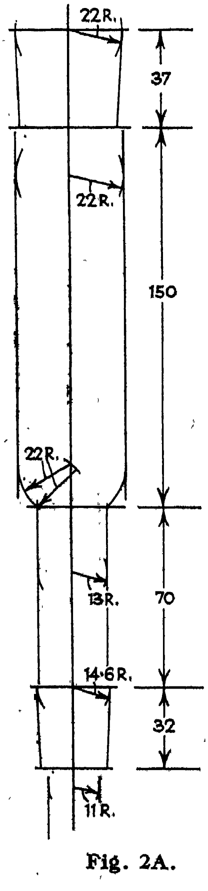

Fig. 2A.

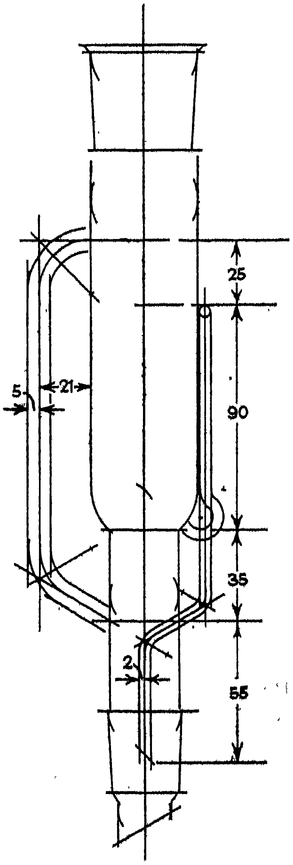

Fig. 2B.

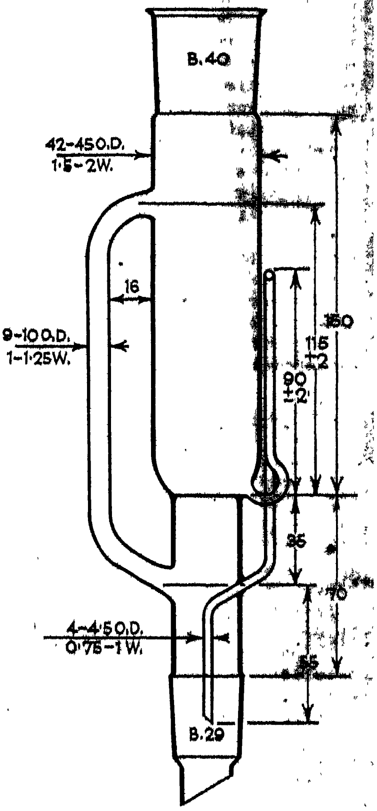

Fig. 2C.

Glass tubing is normally purchased by outside diameter and wall thickness, and these dimensions should be employed and given wherever possible. When an inside diameter is the more important, then this is clearly indicated. In all the drawings depicted here, outside diameters are shown by outside arrows, and inside diameters by inside arrows, but the dimensions are also clearly marked OD or ID respectively. Where a diameter is given without indicating whether it is outside or inside, it is a convention to assume that the outside diameter is required. Except in capillary tubing it is not good practice to give both outside and inside diameters, unless absolutely essential for a particular apparatus, as tolerances must be given on each dimension, and these may work against one another, *i.e.*, plus on one dimension and minus on the other, or *vice versa*, giving in one case an over-thick wall, in the other an over-thin wall, both falling within the tolerances, but not making the apparatus required. Either inside or outside diameter together with wall thickness, both with tolerances, however, adequately look after this point. It should be emphasised that in drawing a graduated tube, the scale length for a given capacity indicates the inside diameter; hence only wall thickness is required in addition. Capillary tubing is generally handled primarily by bore size, on which fairly close tolerances may be given, eg., 1-1½ mm.; 1½-2 mm.; secondarily on external diameter where a larger tolerance is required, e.g., 5-6 mm., 6-7 mm.

Close Tolerances

When a close tolerance for a single apparatus is definitely required, tubing may be selected accordingly—when stocks are adequate—but the larger the number of a particular apparatus likely to be required, the larger should be the tolerances allowed on the component parts. The amount of these tolerances is a matter of considerable knowledge and experience, but generally in small sizes ±½ mm. is allowed on diameter, and in larger sizes, say, ±1 mm., 25 mm.-50 mm., ±1 mm. to ±2 mm. over 50 mm. Wall thickness of tubing as purchased goes in stages, 0.5 to 0.7 mm., 0.8 to 1.0 mm., 1.0 to 1.25 mm., 1.25 to 1.5 mm., 1.5 to 2.0 mm. when in soda glass, but with fewer stages in the resistance glasses. When a small number of an apparatus is required and a close tolerance is necessary, these figures may be halved. For very close figures on internal diameter as in a viscometer or flowmeter, or a fractionating column with internal fitting parts, the possibility of using precision bore tubing should be examined.

Length tolerances depend largely on the glassblower, remembering that the measurements must be made rapidly on hot glass; frequently, and here is where a good drawing helps, the article is laid over the drawing and positions of side tubes, angles, etc. marked off or matched, without any other measurements being made with a ruler. On the drawings shown many figures are given ±2 mm. or ±3 mm. and these are so required in the apparatus and are known by experience to be acceptable. Other dimensions are given with no tolerance figures and these by convention are made to the "nearest convenient."

Dimensions in mm.

All dimensions whether length, diameter, or wall thickness, it will be noticed are given in millimeters. All tubing is purchased now in mm. sizes; inches or any other unit are seldom used in any official specification of glassware. Millimeters are extremely convenient for all purposes, and lead to no errors. An engineering draughtsman of the writer's acquaintance, having struggled with inches, sixteenths, thirty-seconds, sixty-fourths, and thousandths till he was 70 years old, welcomed the change to millimeters for glassware and never wanted to see an inch measure again.

Standard ground joints should be drawn in carefully, and allowance made, particularly in the sockets, for a wall thickness of 1½-2 mm. It is useful to make a small set-square from a piece of celluloid with an angle of 3° to draw the papers. In the sockets it is noticed that the glass wall must expand from the small end, to give clearance for the tip of the cone, and incidentally for the grinding tools.

When a working drawing of an unfamiliar apparatus is required in some detail, particularly of one having a number of internal surfaces, a drawing in engineering style, showing the apparatus in section with outside and inside surfaces of all parts as separate thin lines is best. Such a drawing takes little extra time to execute once it is on the drawing board, and it leaves no doubt as to the sizes of tubing employed and of the spaces between these tubes.

An example in this style, but omitting the dimension lines is shown in Fig. 3. This is a proposed design for a reflux meter for use with a fractionating column. It employs the full bore for the vapour tube advocated by Birch, Gripp, and Mathan[1], but overcomes the intermittent boiling difficulty by employing an outside valve arrangement. This

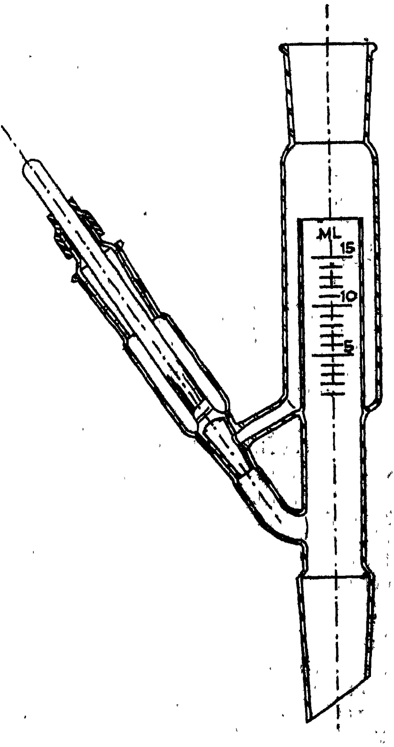

Fig. 3. Drawing of a Reflux Meter for use with an experimental fractionating column.

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[1] *J.S.C.I.* Feb. 1947, p.33.

valve is sealed by the refluxing liquid, but the vacuum seal is completed in a cooler region.

Lastly, a word to chemists; a small drawing board, a T-square, a couple of set squares and a ruler and compass are extremely handy when drawing up an apparatus and will well repay a little practice. Alternatively, small blocks of tracing paper may be purchased from most stationers, having sectional guide cards in ⅛ in. and 1/10 in. squares. Unfortunately, they are not available in millimeters. These guide cards are, however, a great help in sketching either small apparatus in full size or larger apparatus in half size, and the millimeter sizes can be added later. Moreover it is possible to make and keep a carbon copy by going over the drawing a second time.

CHILEAN COAL-TAR PRODUCTS

A Recent Survey

A recent survey of the coal-tar products industry of Chile reveals that the *Sociedad Quimica Nacional* (Soquina) produces 95 per cent of the nation's output of coal-tar chemicals. The company has two plants, one in Santiago and the other in Valparaiso, both closely associated with the gas companies, and about 14,000,000 litres of coal tar are obtained annually, of which 6,000,000 litres are processed. The annual production of cresol amounts to 450,000 litres; 5,000,000 kilograms of tars and pitch are produced. From ammoniacal waters received from the gas companies about 80,000 kilograms of hydrous and anhydrous ammonia are produced annually. The company also makes 600,000 litres annually of wood preservatives and 2,000,000 sq. ft. of impregnated, waterproofed felt, and 100,000 kilograms of floor wax. In addition, various quantities of transmission belt dressings, liquid metal cleaners, protective coatings, and other materials are made and the quantity produced depends upon the demand.

Distilling Equipment

New distilling equipment is being added in Santiago for the extraction of light and heavy solvents, as well as benzene, toluene, xylene, naphthalene, phenol, and paraffin. Production will be almost sufficient to supply Chile's minimum requirements of these products. It is also planned to increase the output of the coal-tar derivatives now being made, which can be easily accomplished as only about 50 per cent of existing capacity is being utilised. The restricted size of the domestic market makes impractical the manufacture of a large range of products. About 200,000 kilograms of oleic acid are being produced yearly for use in making cement. Soquina also manufactures 250,000 litres of linseed-oil-based paints annually, and equipment is being installed to triple production.

Shortages of containers for paint, ammonia, and other products, have restricted output. Some of these problems are less difficult now, and Soquina plans to expand production in the field of sulphonated oils and soaps.

GERMAN IRON ORE

Low Grade Deposits

Because Germany receives no imported iron-ore, she has to rely entirely on her own low-grade deposits. Before the war, the rate of exploitation amounted to 60 to 65 per cent, a figure that was increased during the war to no less than 80 per cent. In 1946, however, owing to the lack of equipment, electric power and labour, there was a decline to 18 per cent.

Iron ore output in 1938 totalled 11,800,000 tons, of which as much as 11,000,000 tons (ferrous content of 3,200,000 tons), were suitable for smelting. Production in 1946, however, amounted to only 3,400,000 tons, of which 2,600,000 (ferrous content of 700,000 tons) were usable in smelters. It appears that a peak output was reached in 1943, when output totalled some 15,000,000 tons (13,000,000 tons suitable for smelting), with a ferrous content of 3,800,000 tons.

Last year's steel production of 2,800,000 tons was largely the result of drawing on considerable reserves left over from the war, and foundries are at present sustaining losses which are being aggravated by the recent withdrawal of the Government subsidy of 4 Rm. per ton. Many establishments have not yet resumed operations at all. The leading iron-ore area is at present the Salzgitter area which accounted last year for 2,400,000 tons, equal to approximately 70 per cent of the total ore production.

Austrian Iron

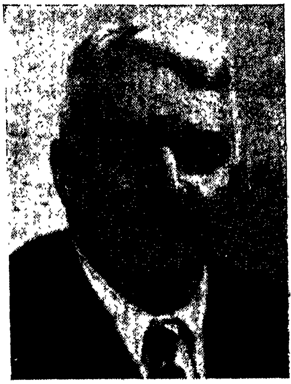
The Austrian authorities hope to bring back the country's iron and steel production to the 1937 level of 650,000 tons. Pig-iron output for 1937 amounted to 390,000 tons. A substantial quantity of the iron and steel output was exported, pig-iron and laminated products accounting for 14.5 per cent of total exports. In October last, pig-iron production amounted to about 50 per cent of the pre-war average as compared with only 25 per cent in July, 1946. Although output was reduced by the eight-week shutdown of the Donawitz blast furnace in February owing to the fuel shortage, it is hoped that this loss will be made good by production from a second furnace which is being planned by the Austrian authorities. If her production could be restored to anything like the pre-war level.

CHEMICAL SYMPOSIUM

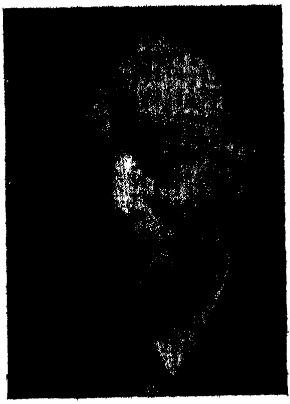
PRESENTED on this page are some of the principal contributors to next week's Coal and Petroleum Symposium at the University of St. Andrews. Mr. C. A. Carlow (1) will introduce the theme and the subjects which the others will discuss will be :—(2) Production of Petroleum by Synthetic Methods ; (3) The Evolution and Physical Interpretation of Synthetic Fibres ; (4) Modern Coal Gasification Developments ; (5) Acetylene Chemistry ; (6) Polythene.

Other speakers will be Prof. W. M. Cumming ; Mr. A. E. MacColl ; Dr. C. E. Hall : Dr. Charles Egloff : Prof. John Read ; Mr. J. H. Brown ; Dr. R. Hill ; Prof. Wynne-Jones ; Dr. Per-olof Kinnell ; Prof. J. N. Bronsted.

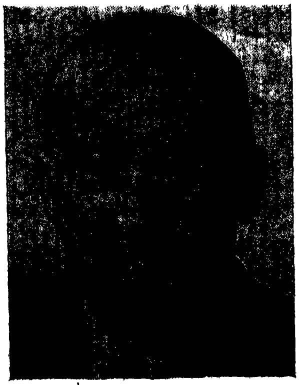
1. Mr. C. A. Carlow.



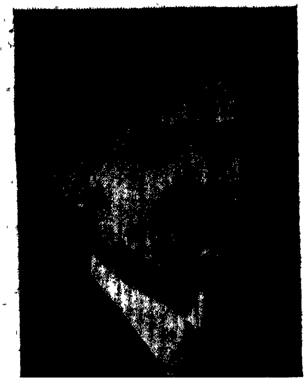
2. Major Kenneth Gordon (I.C.I. Ltd., Billingham)



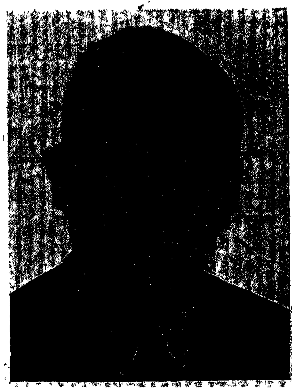
3. Prof. W. T. Astbury (University of Leeds)



4. Dr. D. T. A. Townend (Director, B.C.U.R.A.)



5. Prof. E. R. H. Jones (Imperial College, London)



6. Dr. J. C. Swallow (I.C.I. Ltd., Plastics Division)

PARLIAMENTARY TOPICS

Carbon Black.—A strong argument for immediate steps to utilise for carbon black production "the gas which is escaping at the rate of millions of cubic feet a day in the Middle East"—notably in the oilfields operated by the Anglo-Iranian Oil Company—was made by Mr. J. Lewis in the course of the Consumer Goods (Shortages) debate. He recalled long negotiations with the Board of Trade, in the course of which the Board notified him in November, 1945, that it agreed that we should lessen our dependence on the U.S.A. for carbon black and that proposals were being considered to establish its manufacture at home and in the sterling area overseas. Eventually, said Mr. Lewis, a team was sent by the Board to Germany with a view to acquiring channel black plant to set up in Persia. There was no tangible result. Mr. J. Belcher (Parliamentary Secretary, Board of Trade), in the course of a long reply, said that the project had been carefully gone into and at present, for reasons which it was not politic at this moment to disclose, production in Persia was not a practicable proposition. In reply to a written question by Mr. Lewis, the President of the Board of Trade (Sir S. Cripps) stated that following the visit of a deputation to the U.S.A., shipments of carbon black would increase from July 1, and would be sufficient to allow gradual accumulation of stocks.

Free Market for Fertilisers.—After careful consideration of the potash supply prospects for the 1947-48 fertiliser year, I have decided that all restrictions now in force on the acquisition and use of potassic fertilisers shall be withdrawn as from July 1.—The Minister of Agriculture (Mr. T. Williams).

New Vegetable Oil?—Mr. Peter Freeman asked the Under Secretary of State for Dominion Affairs whether he will make a statement on the production of a new vegetable oil in Tongaland, South Africa; whether the Government is making a grant towards its development; what acreage has been allocated for an experimental plantation; and how long it is expected before commercial exportation can be made to this country. Mr. A. G. Bottomley (Under Secretary of State for Dominion Affairs) said he had no information on the subject.

Trade Allocations.—Mr. J. Morrison asked the President of the Board of Trade for a list of raw materials which are allocated or imported and distributed by trade associations acting as Government agent. Sir S. Cripps gave a list which included the following: casein, rosin and liquid rosin, turpentine, pine oil, linseed oil for the paint trade, glycerine for the paint trade, caustic potash, carbonate of potash, rotenone-containing materials, tin for the pin trade, lead for capsules, collapsible tubes and patent glazing, lead for sheet and pipe (partially).

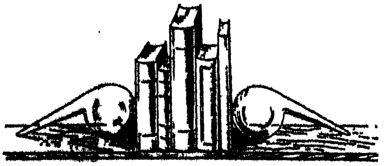
Dead Sea Minerals.—Mr. R. R. Stokes asked the Secretary of State for the Colonies whether he is aware that, according to the investigations made in 1928 into the mineral resources of the Dead Sea, the amount of magnesium chloride available was estimated at 22,000 million metric tons which, together with other salts, at the then ruling prices, amounted to a value of £240,000 million; and why these resources have not been developed.—Mr. Creech Jones: I am making inquiries of the High Commissioner for Palestine and will communicate with my hon. friend when I have his reply.

Government Metal Purchases. — Mr. Keeling asked the Minister of Supply, which metals are still being imported or bought exclusively by the Government; and which have been released from Government control.—Mr. J. Wilmot (Parliamentary Secretary): The following metals are imported or bought exclusively by the Ministry of Supply: Chrome ore, lead, zinc, copper (blister and electrolytic), virgin aluminium, pig iron, steel. The metals and ores which have been released for private importation, subject to licence, are: Aluminium scrap, antimony, bauxite, cryolite, iron powder, manganese, molybdenum, silicon, tunsten, vanadium, zinc concentrates.

Aluminium Scrap.—185,000 tons of aluminium scrap have been recovered at Governmental metal-recovery depôts, and [illegible],000 tons sold. The remainder has been melted down to secondary aluminium ingot. The metal was used during the war in the manufacture of aircraft and afterwards for the aluminium house.—MR. J. WILMOT.

TOO MANY CIVIL SERVANTS

THE directive by the Cabinet for a reduction of 10 per cent in Ministerial staffs is not being implemented. That is the substance of a complaint which the National Union of Manufacturers has sent to the Prime Minister recalling that the Cabinet had asked Ministers to effect a 5 per cent reduction in staffs by March last, with a further equivalent reduction in October. The Union "notes with great disappointment" that Government staffs in April last still numbered 717,000, only 5000 fewer than in January and more than were employed in 1945 or 1946. The Union has now sought an assurance that a reduction of 10 per cent, as a minimum, will be made by October next.



A CHEMIST'S BOOKSHELF

Chemicals: Servant or Master? Bob Edwards. The National Labour Press, Ltd. Pp. 128. Appendix 20. Price 3s. 6d.

The title of this book is theatrical, as befits a publication which seeks to appeal to that hopeful section of the public which would like to "know all about" a highly complex subject in the time occupied by a short train journey and likes its little learning better if it has a lurid twist. In the last respect this production by the Acting General Secretary of the Chemical Workers' Union in co-operation with the National Labour Press, Ltd., certainly fills the bill, invoking (since contemporary shockers in the "sweated labour" department of industry are in the shortest kind of supply) some decidedly moving examples of hardship and suffering by chemical workers—from the records of Keir Hardie! This, however, is in fact only the garnishing of the main theme, which might better have been entitled "Now Let's Nationalise the Chemical Industry." The reason: it is still making big and regular profits (as well as an extraordinary amount of essential chemicals) and is anything but a "closed shop" from the T.U.C. point of view. If the reader is in agreement he will be gratified to note that, because of the concentration of a large part of the heavy chemical industry under the control of a few great undertakings (of which the Imperial Chemical Industries company is given a full length portrait and numerous incidental references), the industry is ripe for the Government basket and could apparently be plucked with next to no trouble at all.

Reclaimed Rubber. The Story of an American Raw Material. By J. M. Ball. New York: The Rubber Reclaimers' Association, Inc. 1947. Pp. 248. $5.00.

This book, initiated and sponsored by the Publishing Association can be considered as the first book devoted exclusively to the subject of reclaimed rubber. A good deal has been written on this subject, of course, but the writings are scattered through countless magazines, books, pamphlets, reports, and patents over a long period of years. It ably covers a wealth of material, collects new data, and presents the whole in a connected form. The result is not a scientific monograph or handbook, but rather a collection of historical, commercial and technical facts on the important industry of rubber reclaiming.

The book is divided into ten chapters, the first of which deals with the early history of this subject. The following chapters cover the various processes for reclaiming scrap rubber, reaching back as far as 1853 when Charles Goodyear was granted a British Patent for the first acid process, which N. Chapman Mitchell developed to an industrial application. Arthur Hudson Marks was the leading figure where the alkali process is concerned, since when nine miscellaneous processes have attained a certain degree of commercial importance, and are briefly discussed in the book. The story of reclaiming is supplemented in a following chapter by remarks on the history and activities of some of the companies now engaged in the manufacture of reclaimed rubber. The next chapters emphasise the economic necessity of the conservation and utilisation of this waste material in peace and especially in war, describe the three leading manufacture processes: the digester, the heater and the acid process, as well as properties and uses. It shows that a certain amount of reclaimed rubber is essential to the manufacture of rubber products, because it possesses certain qualities not found in crude.

The text is well supported by 80 illustrations, by graphs and statistics, and is accompanied by a selected bibliography. The book will be of great interest and help to all who are engaged in this old, yet ever-changing business of rubber reclaiming, now also extended to synthetic rubber scrap.

Foremost among those who are resisting the forces which in this country—and even more ruthlessly elsewhere—seek to eliminate individual liberties and responsibilities is Dean Inge, the former Dean of St. Paul's, whose journalism loses none of its trenchancy with advancing years. This vigour, almost unique, is again apparent in "The Twilight of Freedom" (Post-War Questions No. 30; the Society of Individualists and National League of Freedom, 6d.) in which the Dean studies with refreshing realism the totalitarian trend which in Germany brought the world to disaster and is entrenched even more strongly in other parts of the world to-day under the style of "anti-fascism.

Personal

Sir F. W. de Guingand has been appointed a director of Anglo-Alpha Cement.

Mr. James Brown, a director of Allied Ironfounders, has retired.

Mr. D. J. B. Copp, of University College, Southampton, has been appointed assistant secretary of the British Association.

Mr. H. H. Johnson, Bury, chairman of the Dyers, Bleachers and Textile Workers' Union, has been appointed to a union post at Bolton.

Mr. E. S. Waddington, of Philips Industrial (Philips Lamps, Ltd.), has been elected vice-chairman of the Resistance Welding Machine Section of the British Electrical and Allied Manufacturers' Association.

Mr. A. H. Cleminson has been appointed chairman of Reckitt and Colman in succession to the late Mr. Albert L. Reckitt, and Mr. J. B. Upton has been appointed a vice-chairman jointly with Sir Basil E. Mayhew.

Mr. J. L. Adam, C.B.E., M.I.N.A., chief surveyor to The British Corporation of Shipping and Aircraft, has been elected 1947-48 president of the Institute of Welding, and Dr. J. H. Paterson, F.R.I.C., vice-president.

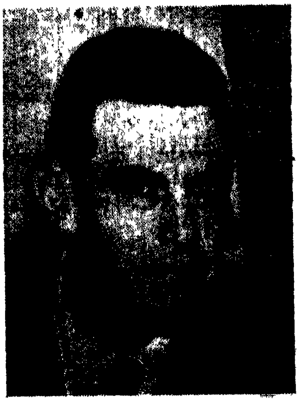
Lord McGowan, chairman of I.C.I., has been elected president of the British Standards Institution in succession to Lord Woolton. The new chairman of the general council is Sir Clifford Paterson, who succeeds Sir William Larke.

Mr. E. Q. Minning, a director of Ajax Chemical Co., Pty., Ltd., of Sydney, is in Britain for the purpose of inquiring into the question of manufacturing certain heavy chemicals, such as sodium sulphide, in Australia.

Dr. Henry Phillips, a principal scientific officer of the Wool Industries Research Association, has been appointed director of research of the British Leather Manufacturers' Research Association. He succeeds the late Dr. Dorothy Jordan-Lloyd.

Mr. E. J. Brunning, president and general manager of the Consumers Glass Company, Montreal, and former coal controller for Canada, has been elected a director of the Government-owned Polymer Corporation in succession to Albert G. Guthrie, who has resigned.

The Board of Trade announce that the following have been appointed additional members of the Council of Industrial Design: Mr. H. C. Wilson Bennetts, technical director of Allied Ironfounders, Ltd.; Mr. G. W. Lacey, director and general sales manager of British Aluminium Co., Ltd.; and Dr. W. J. Warboys, chairman of the Board of Plastics Division, Imperial Chemical Industries, Ltd.



Dr. W. H. Banks

Dr. W. H. Banks has been appointed research superintendent of the Printing and Allied Trades Research Association. Dr. Banks, who joined P.A.T.R.A. in 1938, was principally concerned with research into ink drying and electro-deposition.

The Royal Society of Tropical Medicine and Hygiene have awarded the Chalmers Medal for 1947 to Dr. D. Garnet Davey, I.C.I. Dyestuffs Division. The Chalmers Medal, for distinguished contributions to research in tropical medicine, is awarded biennially to scientists under the age of 45. Dr. Davey's work on the therapy of malaria played a significant part in the discovery of the anti-malarial drug Paludrine. At the age of 34 he is the youngest recipient of this medal.

The chairman and directors of Thos. W. Ward, Ltd., gave a complimentary lunch on Friday, June 20, at the Royal Victoria Hotel, Sheffield, to Mr. Walter Johnson, who resigned the position of secretary of the company on June 30 after 59 years' service, and the opportunity was taken to make a presentation. Mr. Johnson has held the position of secretary for 27 years. In making the presentation the chairman said that Mr. Johnson's experience and service over a period of great development had been of the utmost value to the company. Mr. Johnson will still retain his directorship of Thos. W. Ward, Ltd. The company has appointed Mr. Herbert Beresford to succeed Mr. Johnson as secretary.

Obituary

The death has occurred at Greenock, of Mr. David Templeton, who was formerly employed as a chemist in the Brewers' Sugar Refinery, Greenock, before taking up the post of manager of the Taikoo Sugar Refining Company, Hong Kong, in 1900.

Overseas News Items

Prospecting for Bauxite. — Aluminium Laboratories, an Aluminium of Canada subsidiary, has renewed permits for bauxite prospecting at Pengarrang in the State of Johore, Malaya.

Canada's Rising Exports.—Canada exported goods to the value of $267,800,000 during May, representing an increase of $77,000,000 over the preceding month, and $70,000,000 over May, 1946.

Edible Oils for Germany.—For the first time since the occupation of Germany began, edible fats and oils are to be imported into the joint British - American zones from America and Argentina. The imports will cost British and American taxpayers a total of £2 million. They represent a month's ration.

Australian Imports and Exports. — Australia imported £11,078,000 of oils, fats and waxes during the 8-month period ended February, 1947, the export figures for the same period being £A 948,000; the corresponding figures for paints and varnishes were [illegible]1,000 and £A 220,000, and drugs, chemicals and fertilisers £5,670,000 and £A 3,368,000.

U.S. Rubber Consumption.—It is reported from the U.S. that domestic rubber manufacturers there consumed 395,798 long tons of natural and synthetic rubber during the four months ending April, as compared with 325,872 long tons for the corresponding period of the previous year. 222,208 tons of synthetic rubber were used by industry as against 173,590 tons of the natural material.

Canada's Regional Research. — The National Research Council at its quarterly meeting has approved the establishment of a regional research laboratory at Halifax, Nova Scotia. The laboratory will be built on the campus of Dalhousie University and will be closely integrated with the scientific activities of the university and of the Nova Scotia Research Foundation.

Geneva Trade Talks Extension.—It is reported from Geneva that the world trade talks, still in progress there, and which were planned to end on July 3, may carry on until mid-August. Some of the smaller delegations point out that they lack sufficient members to attend the sub-committees set up to consider the new International Trade Organisation's charter. Since each member of the conference is at present negotiating with 6-12 other countries, it has been found necessary to rearrange committee meetings with a view to overcoming the difficulty.

U.S. Petroleum Imports and Exports.—U.S. imports of petroleum products fell from 15,638,000 barrels in March to 13,887,000 in April, while exports rose from 13,093,000 to 13,640,000.

Dutch Steel Works Now Producing.—The rolling equipment of the Royal Netherlands Blast Furnaces and Steel Works, which had been looted by the Germans in 1943, has now been returned, reconditioned, and put into operation.

Chilean Chemicals.—The price of sulphate of soda, which is now being produced in the Antofagasta district at the rate of about 10,000 tons per month, has risen during the past 12 months from 300 to 800 pesos per ton, owing to the strong demand.

Stockholm International Congress.—1500 delegates from 20 countries are attending the eighth International Management Congress which opened at Stockholm on July 3. It is the first such meeting to take place since the war. The British party, consisting of representatives of 100 firms, is being led by Viscount Leverhulme.

Chilean Copper Sales Corporation.—The Chilean Government has announced its intention of proceeding with the formation of a Copper Sales Corporation to assist the national copper-mining industry, and to provide a central organisation designed to diminish the effects of any economic difficulties which might arise in that industry in the future.

South African Ore Outputs. — Latest statistics issued by the Union of South Africa Department of Mines for period January to September, 1946, show an increase in the production of chrome, manganese and iron ore. Compared with the previous year, the output of the two first-named has been more than doubled, while iron ore production rose from 610,000 tons to over 721,000. Exports of asbestos of all varieties declined from 17,802 to 13,186 tons during the same period.

1170 Steel Furnaces in U.S.—On January 1, 1947, when annual steel capacity totalled 91,241,250 net tons, the number of steel-making furnaces in the United States was 1170, ranging in size from small furnaces producing only a few tons at a time to units making 400 tons per heat, according to the American Iron and Steel Institute. The total of 1170 included 924 open hearth furnaces, 29 Bessemer converters and 217 electric furnaces. The number of blast furnaces at the start of this year, when capacity totalled 65,709,200 tons per year, was 233.

Home News Items

Tungsten Ore Prices.—Prices of tungsten ore have been reduced by 10s., present prices now ranging from 135s. to 145s. per unit, c.i.f.

New Office.—Richard Klinger Ltd., manufacturers of compressed asbestos jointing and boiler fittings have opened a new branch office and depot at 19 Queen Street, Newcastle-on-Tyne.

Cement Output.—534,000 tons of cement were produced in May, as compared with the monthly average for 1946 of 548,000 tons. Exports are being reduced to 50,000 tons per month, destinations being specially approved by the Government.

Five-day Strike.—An unofficial strike which began on June 19 at the United Steel Company's Beckermet No. 1 iron mine in West Cumberland, ended on June 23. The dispute arose over deductions from underground workers' wages.

Paper Output.—Output of paper throughout April rose to a weekly average of 22,011 tons, representing about 56 per cent of the pre-war weekly average. This is an improvement on the February and March totals, but is less than the average weekly figure of 23,767 tons for January.

Scotland Wants Research Stations.—The Scottish Regional Council of the Federation of British Industries decided at its quarterly meeting in Glasgow to urge the Government to provide adequate research facilities in Scotland. It was pointed out that the majority of Government-sponsored research stations were located in the south-east of England.

Cordite Explosion.—One man died and two others were seriously injured after a Royal Ordnance factory explosion, at Glascoed (Monmouthshire), on June 27. All three were injured as they were carrying cordite. It is understood that one man was taken home after the accident. The others were admitted to the Monmouthshire County Hospital, Panteg (Mon.). Details are still being kept secret.

£3 Million Gas Project.—The Ministry of Fuel has given its approval to the first step in a scheme involving the expenditure of £3 million by the United Gas Corporation for reorganising and increasing facilities for gas production in Northern Cheshire. Work is to begin immediately on the erection of a new gasworks at Denton to be opened by the North Cheshire and District Gas Company, which will cost £1,250,000 and have a capacity of 6 million cu. ft. of gas a day.

Chilean Copper.—A cargo of [illegible] tons of Chilean copper, the first to be received since 1939, arrived at Swansea on June 21.

Oil and Fat Prices.—The Ministry of Food announces that no changes will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the 5 weeks ending August 2, 1947.

Paint Control Amendment.—The Board of Trade has made the Control of Paint (Amendment) Order 1947 (a), which came into operation on July 1 and slightly adjusts the existing Order—The Control of Paint, etc. (No. 3) Order, 1942. It is S.R.O. 1947, No. 1292 and costs, 1d.

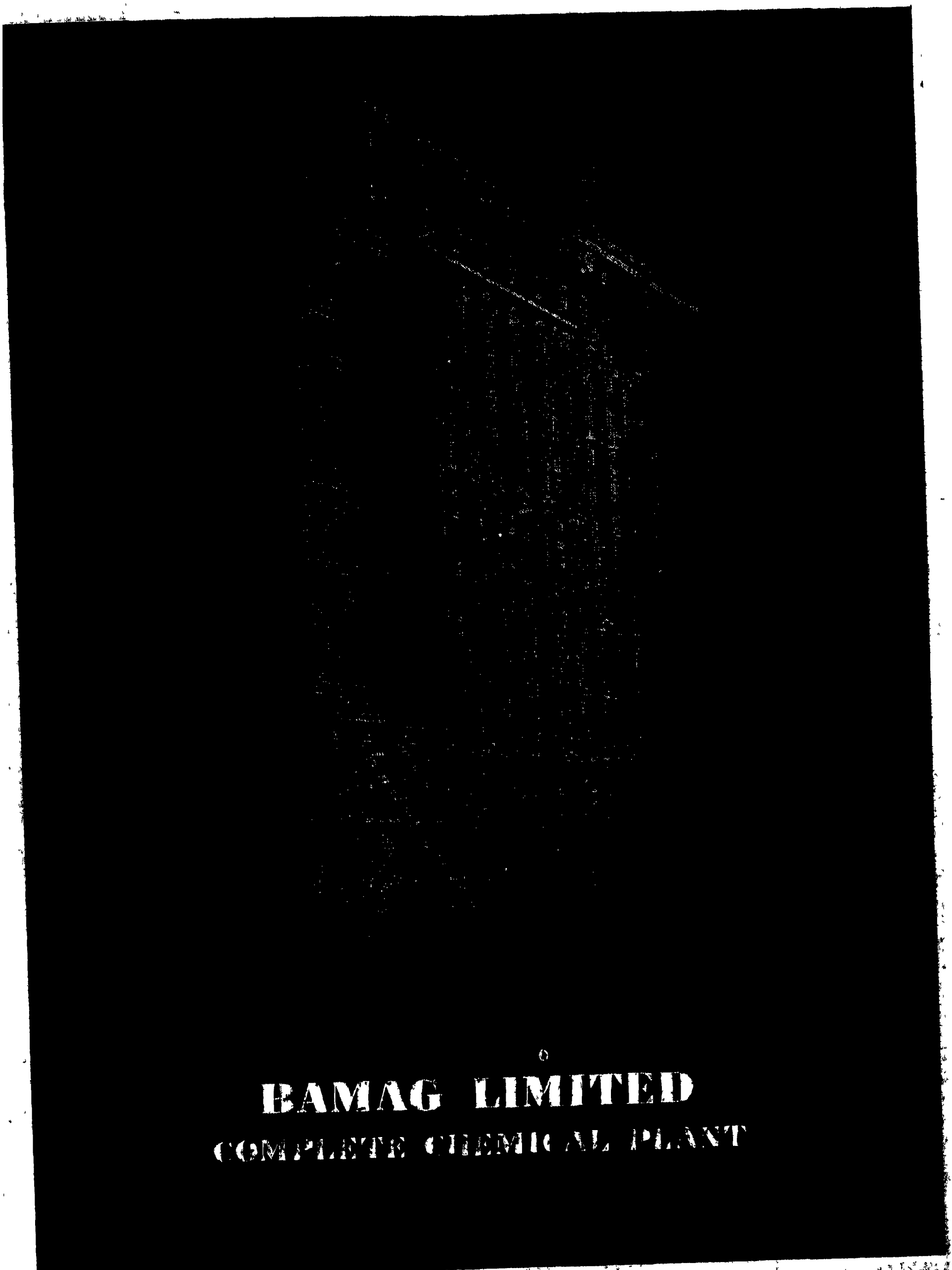
Chemical Firm in Legal Dispute.—A long-standing legal dispute between Bury Corporation and a chemical firm is to be settled by a compromise agreement, states *The Manchester Evening News*. Costs are to be paid by the firm. The cause of the dispute has been kept secret.

Model Distillation Plant.—Correction: The London Aluminium Co., Ltd., makers of the remarkable scale model of a modern distillation and solvent extraction plant, states that the model depicted (THE CHEMICAL AGE, June 7) is, of course, not capable of performing all the functions of the full-sized plant.

Fuel Research Centre.—Falkirk has been recommended as the site of a national fuel research centre for solid fuel burning appliances. That is the recommendation of the Scottish Fuel Efficiency Committee to the Ministry of Fuel, based on the fact that some 75 per cent of all such appliances are made in the Falkirk area.

Metal Furnaces Available.—An electrically-operated vertical furnace, 21½ ft. by 3½ ft. internal diameter with a temperature range of 350°-450° C., and a gas-fired zinc melting furnace (maximum 1000° C.) are among the plant now being offered for disposal by the Directorate of Disposals, Ministry of Supply, Room 531, Great Westminster House, Horseferry Road, London, S.W.1.

Since 1765.—Because recent announcements by Ministers leave little doubt as to the intention of the Government to proceed with nationalisation of iron and steel it appeared "the liquidation of this company, whose roots go back to 1765, may be only a matter of time," states Mr. Andrew White, chairman of Pease and Partners, Darlington, owners of quarries and iron works, in the firm's report for 1946.



BAMAG LIMITED

COMPLETE CHEMICAL PLANT

RICKETT STREET, LONDON, S.W.6, ENGLAND

Sales and Export Department:

UNIVERSAL HOUSE, BUCKINGHAM PALACE RD., LONDON, S.W.1

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Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

WELLCOME FOUNDATION LTD., London, N.W., chemical manufacturers. (M. 28/6/47.) May 9, £250,000 (not ex.) mortgage to Wellcome Pension Fund; general charge. *Nil. July 22, 1946.

PEEL LABORATORIES, LTD., London, W.C. (M., 5/7/47.) May 15, series of £2000 (not ex.) debentures, present issue £500; general charge. *Nil. January 14, 1947.

ASHE LABORATORIES, LTD., London, S.W. (M., 5/7/47.) May 13, mortgage to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Acme Works, Leatherhead, with plant, fixtures, etc. *—. May 12, 1946.

GRIFFIN & TATLOCK LTD., London, W.C., philosophical and chemical instrument makers. (M. 28/6/47.) May 14, charge to National Provincial Bank Ltd. securing all moneys due or to become due to the Bank, charged on plot of land near Willow Lane, Mitcham, with fixtures, &c. *Nil. July 14, 1946.

NORTHERN INDUSTRIAL CHEMICALS LTD. Kirkby. (M. 28/6/47.) May 17, £6980 mortgage to City of Liverpool; charged on land with buildings thereon at Kirkby Trading Estate, Kirkby (lately Royal Ordnance Factory) known as 6A6, 6A9, 6A7, 6A8, 6A10, 6A11 and air raid shelters with fixed factory plant and fixtures.

INTERNATIONAL CORRODELESS LTD. Enfield, metallurgists. (M. 28/6/47.) May 13, by order on terms, resolution of shareholders dated March 25, 1947, confirming and ratifying a charge dated May 28, 1946, and registered June 11, 1946, to Lloyds Bank Ltd. securing all moneys due or to become due to the Bank; general charge. *£25,000. April 8, 1947.

CHROMOCINE, LTD. (formerly CHEMICAL DEVELOPMENT CO., LTD.), London, W., chemical dealers. (M., 5/7/47.) May 27, mortgage to Martins Bank, Ltd., securing all moneys due or to become due to the Bank; charged on 147 and 149 Kensal Road, Kensington, with machinery, fixtures, etc. *£4000. May 28, 1946.

PURE CHEMICALS LTD., London, W. (M. 28/6/47.) May 14, £18,05[illegible] [illegible] to City of Liverpool; charged [illegible] with buildings thereon at Kirkby T[illegible], Kirkby (lately Royal Ordna[illegible]) known as 6C1 to 6C17 (incl[illegible]) [illegible]D10, 6D12, 6D14 and air raid shelte[illegible] factory plant and fixtures. *Ni[illegible] 8, 1946.

Satisfaction

WARD BLENKINSOP & [illegible] LTD., London, W., manufacturing [illegible]mists. (M.S., 5/7/47.) Satisfaction [illegible] 21, of debentures registered August [illegible] to the extent of £4500.

Company News

The nominal capital of **Elect[illegible] Ltd.**, mechanical, electrical and [illegible] engineers, etc., 2 Southey Road, [illegible], has been increased beyond the [illegible] capital of £10,000, by £10,000, in [illegible] per cent cumulative participating [illegible] shares.

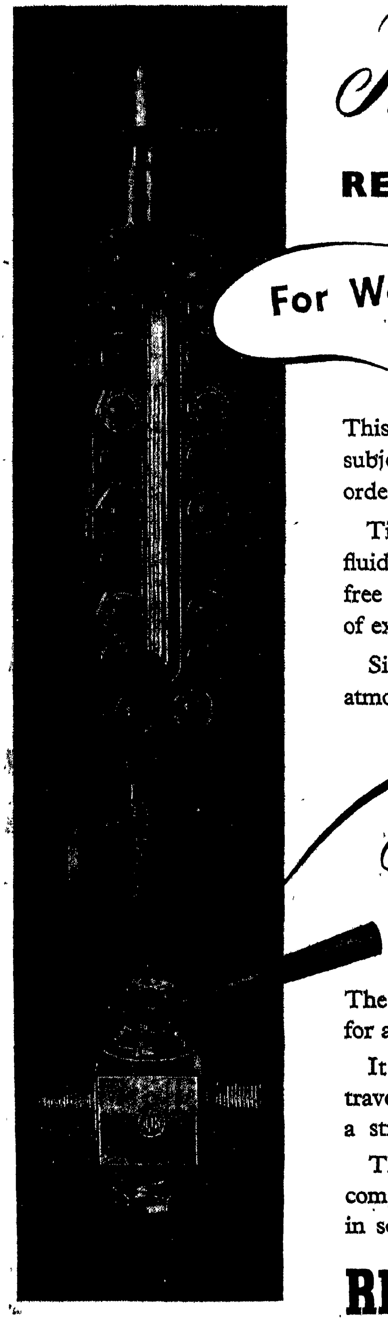
Limmer and Trinidad Lake [illegible] announces a trading profit of £98,[illegible] [illegible]pared with last year's figure of £8[illegible]. A final dividend of 7 per cent is bein[illegible] [illegible]mended, making a total of 10 per [illegible] for the year as against last year's total [illegible]dend of 8½ per cent.

Ballito Hosiery Mills Ltd. has an[illegible] a net profit for the year just en[illegible] of £11,571 as against the previous year[illegible] of £11,058. A dividend of 12½ per [illegible] been recommended on the ordinary [illegible], and approximately 9½ per cent [illegible] preference shares.

British Coal Distillation proposes to [illegible] and issue at par £25,000 of 5 per cen[illegible] lien participating debenture stock t[illegible] before existing first debentures, and [illegible] to receive 80 per cent of net profits i[illegible] year until redemption at par on J[illegible], 1957.

Chemical and Allied Sto[illegible] and Shares

STOCK markets could hardly be oth[illegible]wise than depressed in view of the P[illegible] Conference news of the all-important q[illegible]tion of U.S. aid to Europe and the Gove[illegible]ment's proposed " cuts " in imports wh[illegible] have emphasised the serious position n[illegible] taking shape. There was no big liqui[illegible]tion, but small selling persisted and prior to the commencement of the new Stock Exchange account the lower prices failed to attract buyers. Weakness in British Funds has featured with a further all round decline, 2½ per cent Treasuries at 91¾ touch-



Klinger TYPE S.300
REFLEX LEVEL INDICATORS

For Working Pressures of 300 Atmospheres

This level gauge is so designed that the glass is *not* subjected to high, mechanically applied stresses in order to make a tight joint.

Tightness of the joint is provided by the internal fluid pressure so that the glass is evenly loaded and free to adjust itself in the gauge body to inequalities of expansion.

Similarly designed gauges are available for 400 atmospheres (6,000 lbs per square inch pressure).

Klinger HIGH-PRESSURE
SLEEVE-PACKED COCKS

The small steel cock illustrated ($\frac{1}{16}$" bore) is suitable for a working pressure of 6,000 lbs per square inch.

It opens and shuts with a 90° movement of the lever, travel being limited by a stop and when open gives a straight through uninterrupted full bore passage.

The cock depends for its tightness on a renewable compressed asbestos Packing-Sleeve and can be made in several sizes with any desired type of connection.

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ing the lowest level since dealings commenced at the beginning of this year. Shares of industries affected by the proposed "cuts" in imports weakened, although elsewhere, textile shares hardened on the big drive expected in export markets.

Chemical and associated shares were not immune from the market reaction, but in most cases movements on balance were moderate, the industry's big scope for expansion being more widely recognised. Imperial Chemical eased to 51s. 3d., Monsanto Chemicals were 61s. 3d., while Fisons at 67s. 6d. have been steady following the statements at the meeting. Borax Consolidated at 60s. 6d. have been helped by market views as to the scope for higher dividend, and elsewhere, Cooper McDougall & Robertson have changed hands around 43s., the big agricultural and kindred developments and the £100 million Corporation for Colonial development opening up scope for expansion in the activities of chemical fertiliser and kindred companies, according to prevailing views.

Reflecting market conditions, Dunlop Rubber came back to 77s. 10½d., but General Refractories at 25s. 6d. have been relatively steady, and British Aluminium have eased to 50s. 3d. despite current reports of active trading. Elsewhere, Amalgamated Metal gave way to 18s. 9d., and Imperial Smelting were 20s. 6d., although British Match strengthened a little to 48s. 3d.; Turner & Newall at 90s. have moved back, and in other directions, Lever & Unilever receded to 52s. 9d., while Metal Box eased to £5 15/16 following the new capital proposals. There were only moderate movements in the iron and steel sections, but Richard Thomas & Baldwins strengthened to 13s. 6d. on the higher dividend. United Steel were 25s. 9d., and Stewarts & Lloyds eased to 54s. 4½d., but Baldwins Holdings firmed up to 7s. 7½d. Babcock & Wilcox at 77s. 9d., and Clarke Chapman at 63s. 9d. lost part of their recent gains, and Allied Ironfounders after reflecting satisfaction with the dividend, eased to 79s. 3d. Low Temperature Carbonisation 2s. shares gave way to 5s.

The unchanged British Plaster Board dividend caused a little disappointment in the market and the 5s. shares receded to 31s. Associated Portland Cement were steady at 74s. 6d. Elsewhere, British Glues 4s. ordinary remained at 20s. 9d. Beechams deferred have eased to 26s. 7½d., and Sangers to 38s. 6d., while Griffiths Hughes were 58s. 6d. Glaxo Laboratories have come back to £25¼, and British Drug Houses eased to 62s. 6d. following publication of the full results. Lawes Chemical 10s. shares were 14s. 6d., and Major & Co.'s 2s. ordinary 5s. 3d. On the other hand, B. Laporte have come back to 101s. 3d., and W. J. Bush to 93s. 9d., but the shares were held firmly and not in large supply in the market.

Activity in oil shares became less pronounced, although sentiment remained under the influence of the exceptionally big expansion in the Anglo-Iranian profits and the raising of the dividend from [illegible] per cent to 30 per cent. Anglo-Iranian [illegible] after rising 30s. to £9¾ came back [illegible] and Burmah Oil at 88s. 9d. were [illegible] ance partly because of the company's large shareholding in Anglo-Iranian. Shell, however, fell to £5½, while V.O.C. lost part of the rise which followed the full results and Lobitos were only moderately higher, oil shares coming under the influence of Mr. Dalton's "cut" in petrol imports.

British Chemical Prices

Market Reports

PRESSURE for supplies describes most sections of the industrial chemicals market and the demand for home account and for shipment shows no sign of diminishing. Values throughout the market are firm and while price alterations are expected in some directions nothing has been notified at the time of this report. The home production position is reported to be improving and delivery specifications are being met with regularity. There have been no outstanding features in the coal-tar products market where all available supplies are finding a ready outlet.

MANCHESTER.—The demand for heavy chemicals from the cotton textile and allied trades has been affected to a slight extent by the incidence of the annual holidays in one or two Lancashire towns, but the industrial demand generally on the Manchester market is on steady lines and in the aggregate substantial deliveries are being called for. Additional business in the alkalis and other leading "heavies" has included a fair amount on home trade account, with shippers also prominent with inquiries for export. The movement of fertiliser materials is now distinctly quieter. In the tar products market new orders have been on a moderate scale, with a steady absorption of supplies against existing commitments.

GLASGOW.—Business in the Scottish chemical trade has been well up to standard during the past week. In the export market a number of orders have been booked, particularly for bleaching powder, for which there has been a heavy demand. In the home market, the main shortages have been calcium chloride, calcium nitrate and Glauber's salts. The first two have been much shorter than they were during the war years. The shortage of Glauber's has been accentuated by the difficulty of crystallisation during the hot weather.

The Chemical Age

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Telegrams: ALLANGAS FLEET LONDON
Telephone CENTRAL 3212 (12 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street. Birmingham (Midland 0784-5)

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The Chemical Society

THE Minutes of the Proceedings of the Royal Society of Arts dated February 17, 1841, record a letter from Mr. Robert Warington asking for permission "for a certain number of scientific men to meet together in the committee room in order that they might consider the formation of a society of chemistry and mineralogy." From this modest beginning was built up the Chemical Society. The historic meeting in 1841 enrolled 25 members. To-day the Chemical Society can count over 6000 members. It was not the first of the chemical societies. There were many small private chemical societies before 1841, but none lasted for any great length of time.

Whether the new body formed 106 years ago owed its success to the skill with which it was managed or to the fact that it provided something different from the societies which had gone before we do not know. The Society itself believes that its success was due "almost entirely to the ready means it has provided for chemists of publishing their discoveries and of affording them a place for discussion and mutual interchange of ideas." Whatever the reason, the Society flourished exceedingly. It has been the model and the elder sister of similar chemical societies set up in other countries and it has had among its presidents such giants of chemistry as Graham, Hofmann, Williamson, Edward Frankland, Odling, Gilbert, Sir William Perkin and W. H. Perkin, Crookes, Ramsay, Dewar, H. E. Armstrong, Meldola and Pope.

The Chemical Society would normally have celebrated its centenary in 1941, but more pressing events were then claiming the attention and energies of its members. Next week are to be held the deferred centenary celebrations to be followed immediately by the 11th International Congress of Pure and Applied Chemistry.

Our congratulations and those of all scientists, whatever branch of science they pursue, are offered to the society upon its long and exceedingly useful life. What has been its influence on the development of chemistry over the past century is difficult to assess. It is not easy to point to positive achievements by the Society as such, but the medium which it has provided for publication of research and for discussion of those researches has exercised a very powerful influence upon the development of chemical thought all over the world.

The foundations of modern chemistry were being laid about the time when the Society was formed. Lavoisier had gone to the guillotine nearly 50 years previously, but with Laplace he had laid the foundations of thermo-chemistry, he had distinguished clearly between physical and chemical change and he was already advancing into the realms of bio-chemistry. A few years later Dalton brought forward his atomic theory which has been described as "a flash of genius that crystallised an idea that had been floating in men's minds for centuries." Humphrey Davy had isolated the alkali metals and Berzelius had performed his amazing determinations of the atomic weight of every known element and of the composition of many compounds. A young school of chemists comprising Dumas, Leibig and Wohler was beginning to feel its way into organic chemistry and its members' discoveries

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were disturbing the generally accepted views.

Into this difficult and interesting period came the Chemical Society, and there can be little doubt that its members found plenty of fuel for their discussions and arguments. Among the early members was Kekulé, who had come from Germany in 1853 and who declared that his theory of the structure of organic compounds started in a dream about atoms one night when he went to sleep on the top of an omnibus between Islington and Clapham Road. The early meetings of the Chemical Society must have been enlightened by many such discoveries and ideas of a fundamental nature such as are much less often heard to-day, probably because of the very great development of the science during the last 100 years.

The development of chemical science over the intervening century is recorded in the textbooks. The groundwork of organic chemistry was almost wholly a product of that period. Advances in inorganic chemistry comprised the discovery of many new elements and the rise of the Periodic System. Physical chemistry, unknown in 1841, has now become one of the branches of outstanding importance in which the beginnings of chemical reactions and equilibria on the kinetics of the individual molecule or ion are discussed. Physical chemistry quite naturally embraced the application of thermo-dynamics to chemical reactions. Then towards the middle of the era there came a period of great and far-reaching discoveries which laid bare (so far as we know at present) the innermost structure of the atom and changed the whole concepts of physical and chemical science.

Finally, some mention must be made of the building up of complex molecules by synthesis, such as were previously obtainable only from natural products, and from this rose great industries based upon what are now known as plastics.

There have been criticisms of the Transactions of the Chemical Society as containing too many papers of little or no interest, many of them mere records of the successful preparation of new compounds and the determination of their physical properties. We have never shared such objections. The Chemical Society exists for the purpose of studying pure chemistry and as such it is its duty to record whatever facts are ascertained and appear to be worthy of permanent record. What use will ultimately be made of these facts is not the responsibility of the Chemical Society, but events have shown that a very great deal has been done with them. They have been made the basis for vast chemical industries.

Past achievements are a challenge to the future. What use shall we make during the next century of the tools which the chemists of the last have put into our hands? It would not be very far from the truth to suggest that that is a problem which will decide the future of the human race for generations to come.

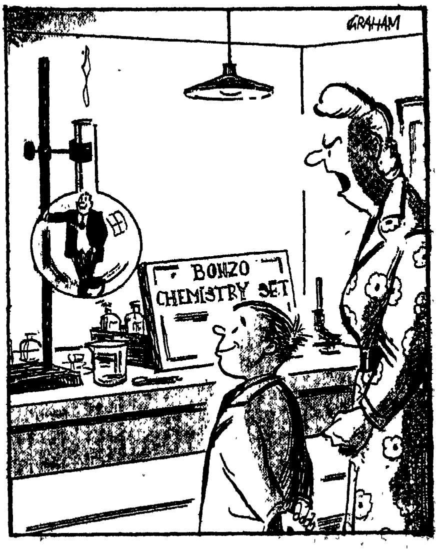
NOTES AND COMMENTS

Coal Deadlock

NO excuse need be offered for adverting at short intervals to the subject of coal. The course of events, continually bringing fresh evidences that the problem of increased production which the National Coal Board "cured" by application of the five-day week is as recalcitrant as ever, would strain the escapist powers of an ostrich. For most of us at this moment the significant facts are that coal production in the first weeks of June is seriously below the level which would reach by the year's end the 200 million tons "outer" which has been taken as the minimum score on the target for the mines; that strikes are as common as ever they were; and that hopes of converting industrial plants to oil or any other source of power are more remote than we thought. The National Union of Mineworkers, holding their annual conference in Scotland this week, could not have chosen a more impropitious moment to celebrate the benefits of public ownership of the mines—if that was their intention. Any intended festivities, it is felt, will have received a pronounced chill from the letter to the miners' leaders from the Coal Board chairman (Lord Hyndley) warning them that unofficial strikes must stop and that if they do not the Board is prepared to issue summonses against strikers for breach of contract. How he proposes to apply legal sanctions against groups of several thousands he does not make clear. The plain fact which today's "owners" feel it inconvenient to acknowledge is that strike fever in several coal areas is an endemic complaint which national management has done nothing to eradicate. Inspired leadership which does not depend upon disciplinary action might provide the solution, but there is not a vestige of evidence that the present arbiters of mining affairs, from the head of the Coal Board to the miners' secretaries, are ever likely to provide it.

More Millions

PRICES are still going up. That, disregarding for the moment the implications and manipulations of the national budgetary arrangements, is pre-eminently the disturbing fact underlined yet again in estimated £1700 million (+£232 million) provisional cost of the U.K. "austerity" import programme for the remainder of this year and the first half of 1948. It is an interesting, if melancholy, document which shows that our imports of raw materials and supplies in the next 12 months are to cost £640 million—just £15 million more than this year's bill. If that addition represented a proportionate increase of the commodities which keep our industrial wheels turning, Mr. Dalton's revelation would rank as good news of the most acceptable sort. It does not. It is almost exclusively the cumulative effect of the new price structure which provides that a shipment which cost 100s. a ton will in future be charged at about 103s. If the theoretical cargo is of chemical materials the rise will have been much steeper, as any chemical manufacturer in this country can testify. Chemicals have outpaced most other commodities in the race for dwindling sterling and, although they are not separately dealt with in the present figures, the comparison of general import prices with 1938 as the 100 per cent base-line leaves no doubt what has been happening. Here are the figures: June 1946, 203;



"There now—just look what you've done to your father" (*Evening Standard*).

September 1946, 208; December 1946, 219; March 1947, 229; May 1947, 241.

Costs Still Rising

THE tendency to regard the U.S.A. as our "registered supplier" is fortunately not entirely in accordance with the facts, but it is true that no substantial price change across the Atlantic can leave us unmoved. Any contemporary view of the American scene leaves no doubt at all that further price movements are impending and that they will follow the customary spiral in the familiar direction. There, as here, the motive power in this financial equivalent to perpetual motion is the mounting labour charge, by comparison with which the equivalent here seems only a moderate growth. American soft-coal miners, for example, were last week reported to have forced a tentative agreement to a wage increase equivalent to 15s. a day, which would add "at least 3s. 6d." per ton to the price of American soft coal. This is only one of the base materials which help to fix U.S. production costs, but it is fairly typical of the "squeeze" which, with the apparently insatiable demand in America's home chemical market, will not render any easier such commodities our industry hopes to get from that quarter.

SOUTH AFRICAN CEMENT INDUSTRY

GOVERNMENT REPORT ON "MONOPOLY"

FOLLOWING the Union's decision last November to import cement, owing to the prevailing shortages, orders for about 80,000 short tons have been placed; the target is 150,000 short tons a year. South Africa's own production is about 1,250,000 tons a year. Belgium, Denmark, Poland and Yugoslavia are the present sources of supply, but so far, owing to lack of shipping space, only about 1,000 tons have arrived.

The Board of Trade and Industries, whose report on its investigation into the cement industry was tabled in the House of Assembly, recommends that the control exercised over prices by the Government should be continued in the interests of consumers. Monopoly conditions in the industry, says the Board, have led to price discrimination and monopoly profits. Furthermore, the pricing system involves cross-haulage, which may be expensive in normal times.

In the past, the prices of cement in the Union were fixed at an unduly high level, partly because costs of production were unnecessarily high, partly owing to protection and partly through monopolistic conditions, says the report. Protection enabled producers to charge higher prices in the coastal areas than would otherwise have been possible.

The report adds that as there is an acute shortage of cement it would be senseless to tax imports which do not endanger the existence of local producers in the immediate future. Any duty provided in the customs tariff should therefore be suspended, at least temporarily. In view of the fundamental importance of cement, the board feels that the Government would be justified in drastically reducing the duty. It should be a condition of whatever protection is retained that prices will continue to be subject to control by the Government.

The board says the Pretoria group of companies holds a dominating position in the industry. In 1945 the three companies there had three-fifths of the total sales by cement firms in the Union. They paid the highest average dividends in the period 1938-44, and in 1945 handled nearly 70 per cent of the profits of the industry.

The net operating profits in 1938 averaged about 9½d. a bag or 32 per cent of the sales of high dividend payers, and 6d. a bag or 29.7 per cent of those of low-dividend payers, states the board.

"FRUSTRATION . . ."

Materials, alike for output and for construction, are scarcer; prices have soared higher than ever; permits are slower, with wide gaps between them and licences; Government methods are as cumbrous, tortuous and uninforming as ever. We are expected to make a good export showing with a 35 per cent allowance of pre-war oil doled out at about eight times pre-war price. Government has appealed to management and labour throughout the country for higher efficiency and greater effort; and both are, in our experience, more than ready to meet it. But we find few signs of mutual and co-operative effort from the Government side; and the interests of the consumer appear in their view to come a bad third. It has been a year of almost complete frustration. If such are the results of control in a seller's market, what may we look for when competition must be faced?—SIR JOHN N. BARRAN, chairman of Barry and Staines Linoleum, Ltd., in the company's annual report.

Production in April and May

Better Supplies of Sulphuric Acid and Fertilisers

ALTHOUGH levels of production of many basic materials in the U.K. are still manifestly lower than national requirements, a fairly steady improvement is apparent in a number of chemicals and associated materials, of which the production, consumption and stocks in April and May are reviewed in the June issue by the Central Statistical Office of the monthly *Digest of Statistics.*

In one or two important directions, such as sulphuric acid and fertilisers, there has been significantly increased production, but because of the heavy accumulated demand no large stocks have yet been built up.

(*The figures which follow are in* 000 *tons*).

Production of sulphuric acid in May once more approximated the very high figures of December and January last (the highest on record since 1935) and at 115.8 was 6.3 better than the April production.

Consumption showed a fall of 0.9 at 18.2 and stocks were 8.6 better at 79.2. Consumption of pyrites (16.9) and sulphur (18.2) were higher, as expected, but stocks of both improved at 89 and 79.2 respectively. Sulphuric acid stocks were slightly reduced at 66.4; spent oxide at 145.1 was 2.7 higher.

Record for Superphosphates

In the agricultural supply field, compound fertiliser production in April was at a level reached only twice before (in March and April last year), totalling 180.4, as compared with 119.8 in March. Superphosphates in the same month showed the figure 91.3, which has never previously been equalled. Consumption of superphosphates and compound fertilisers was on a greatly enlarged scale at 112.5 and 252.6, respectively, and stocks of both were heavily down at 79.8 and 83.7. Consumption of ammonia in May was 3.3 higher at 23.83, and of phosphate rock for fertilisers (in April) 70.7 as compared with 61.1 in March. In April the stock position was: ammonia 3.6 (March 3.25), phosphate rock for fertilisers 112.7 (117.9), for industrial uses 34.6 (38.2 in May). The nitrogen content of fertilisers was at the low level of 8.6, which compares with 11.9 in March and 20.1 in February last, but was still slightly higher than the previous April average.

Production of cane molasses in April was slightly better than a year ago at 6.9, while beet molasses, 0.2, was the smallest output on record; winter production has been as high as 48.1. Industrial alcohol in the same month totalled 2.26 million galls. (1.72 last year) and consumption—2.4, was also 0.8 higher than a year before. Stocks, 4.2, were, however, substantially better than in the previous April; molasses stocks of 133.5 were substantially below level in recent months.

In the rubber industry the supplies of waste, 0.04, and of reclaimed material 0.42, were both lower, consumption showed a slight general decline and stocks of waste (81.4), natural (131.7), and synthetic rubber (2.90) were all very substantially smaller than in April, 1946.

British Steel Standards

The British Standards Institution has just issued a revision of B.S.970 for wrought steels, which was first prepared as a war emergency specification. Owing to its great usefulness, however, many requests have been received for its continuation, and it now covers the needs of the general engineering industry including the automobile industry. Provision is made for some 90 wrought carbon and alloy steels of tensile strengths varying from 28 to 100 tons per sq. in. Included in the general clauses are heat treatment and general definitions, test specimens, method of test, and inspection, testing and retesting facilities. The chemical composition, condition on delivery, heat treatment and mechanical properties are specified for each steel.

German Soap Production

Unilever, Ltd., exported to Germany recently 1000 tons of fatty acid. This will facilitate a fuller utilisation of the Sunlight A.G. plants in the Rheinau suburb of Mannheim (U.S. zone). (The Sunlight A.G. is attached to the Unilever group). The plant, situated on the edge of this much-bombed city of Germany, escaped damage and employs at present 75 per cent of its normal staff who run the works at 60 per cent capacity.

Liquid Sunlight soap is at times unobtainable in Germany, partly owing to the fact that the necessary bottles from Saxony are not yet available. Efforts are now being made to secure them through a compensation deal. Because of the scarcity of raw materials 50-80 per cent of fat has to be saved in the manufacture of soap. The percentage of fatty acid in soap powders had to be reduced at times to less than one-fifth of the normal content.

South Africa's New Chemical Industries

Long Term Contracts from Europe and America

(From our Cape Town Correspondent)

MR. W. STEELE, president of a large American concern manufacturing vermiculite has contracted to buy the total output of the newly opened vermiculite mines in the Northern Transvaal. Mr. Steele pointed out to the mining authorities that not only was the ore of a higher grade than that mined in America, but it was dug by African labourers at about one-twentieth of the American costs. Arrangements have been made to ship 25,000 tons of the ore to America this year. By 1948, when American machinery has been installed, 180,000 tons will be exported. The total American production last year was 75,000 tons. The Northern Transvaal has rich deposits of vermiculite, a product of oxidised mica which has high insulating properties. It was a geological curiosity until 1931, when experiments disclosed that when heated it exploded like puffed rice to form an insulating material with a range of up to 2500° F.

Little use was made of the material at first owing to the high production costs. During the war, however, it was increasingly used in the hulls of ships, and in insulating oil-less bearings, and when it was found that one inch of vermiculite had the insulating and fire-proofing value of eight inches of brick or 2 in. of concrete, its commercial value was greatly enhanced.

* * *

In the Prieska and Hay districts of the Cape Province fairly pure saltpetre, potassium nitrate, have been found. They occur as incrustations, in veins and pockets, and in clayey ferruginous matter on cliff faces. The deposits are scattered over a considerable extent of country stretching from Griquatown to 20 miles south-east of Prieska, the nitrate belt being co-extensive with the outcrop of the rocks of the Lower Griquatown series. The deposits owe their origin to a process of nitrification by bacterial action on the excrement of small mammals and birds, the potash having evidently been derived from shales of the Griquatown series which have been proved to contain appreciable amounts of potash. Attempts to work these deposits have so far failed.

* * *

The main objects of the Paint Industries Research Institute, founded at a meeting of representatives of the South African paint industry in Durban recently, will be to ascertain how far local materials can be used in paint manufacture, and the kinds of paint best suited for South Africa.

A South African Railway delegation has visited Burgersfort to examine the possibility of establishing a line through the Northern Transvaal chromite belt, said to be the richest and largest in the world. A prominent Transvaal mining engineer said that if the delegation recommended the establishment of a railway line, South Africa would obtain a virtual stranglehold on the world chromite market, which was at present extremely short of the mineral. The Transvaal already produces one-fourth of the world's chromite but, lack of adequate transport has so far prevented full exploitation of the deposits.

* * *

Industrialists in America and Europe, faced with a critical shortage of chrome from local sources, are turning their attention to the Pielandberg district of the Transvaal, near Rustenburg, where large deposits of high-grade chrome ore are to be found, and there is every likelihood of the Union shortly becoming a major supplier of chrome. According to a director of one of the leading South African chrome-producing mines, the demand for chrome before the war was not so large as it is now. Then chrome was used mainly in the manufacture of chemicals and the demand was catered for by the deposits in America. The war, however, stimulated the use of chrome in other industrial activities, and today it is used more extensively than ever in the manufacture of stainless and rustless steel. The war years led to the almost complete exhaustion of the stock piles of chrome ore maintained by the large steel producers in the United States and Europe, with the result that American and European industrialists are "now only too glad to sign contracts for long periods with South African producers," said the director. He felt confident that South African mines could easily meet all of the demand, since the Transvaal had what he claimed to be the biggest chrome deposits in the world. The only drawback up to now had been the shortage of machinery, but this was being overcome. The richest deposits of chrome ore were found in the Swartkop and Palmietfontein areas of the Pielandberg district, as leading technologists who had visited this area recently had confirmed. The latest figures available are for the period from April, 1945, to March, 1946, and they show that about 200,000 tons of chrome were then exported from South Africa. The biggest buyer was the United States.

Chemistry of Coal and Petroleum

Representatives of Many Nations at St. Andrews Symposium

IN this centuries old university, chemists from many foreign countries this week spoke on modern chemical research work which aims at converting the world's coal and oil resources into useful chemicals. Representatives from India, Turkey, Belgium, Sweden, Denmark, America and other countries attended the symposium on the "Newer Derivatives of Coal and Petroleum," while many British chemists were present to hear foreign and home experts present their views.

In formally opening the symposium on Monday, Sir James Irvine, principal and vice-chancellor of the University of St. Andrews, said that coal was something more than a material that was designed for combustion alone. It was something which ought to be and could be used more profitably as a source of diverse organic compounds. We were, he said, on the verge of an enormous phase of development in chemical synthesis.

The Prospect

In opening the session devoted to "Coal and Oil Resources," Mr. C. A. Carlow, of The Fife Coal Co., painted a rosy picture of the future when coal, in the hands of scientists, will be used to produce all sorts of materials from rubber to curative medicines.

The purpose of the symposium (he said) is to provide for industrial scientists and others a comprehensive survey of developments which have taken place in organic chemical industry.

The difficulty of securing contact between those carrying on research and those likely to benefit from such research has always been present and has been a definite obstacle in the way of advancement. Scientists dislike publicity, and yet publicity is essential if the scientists' work is to bear fruit.

This symposium, therefore, in so far as it succeeds in its objective, will perform a most useful and necessary function. This is particularly true while the country is passing from war conditions into a period of peaceful development. Now is the opportunity—a great and important opportunity—of making use of discoveries, part of which may indeed have been born in an atmosphere of self-preservation during the war years.

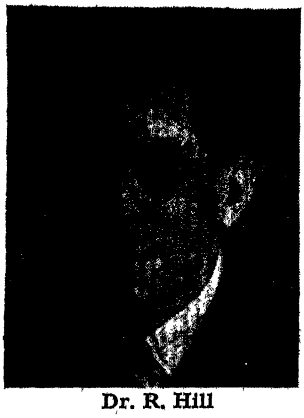
British Coal Reserves

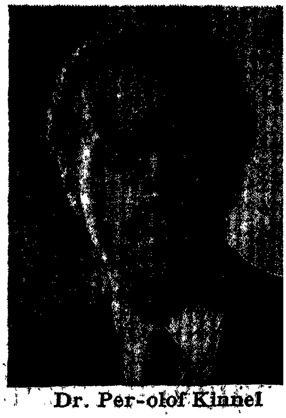
Two days are given to matters concerning coal and oil. One may be at liberty to express the hope that of these two, coal wil predominate. Coal is a natural product o this country, and by far the most valuabl of the gifts of nature. Oil, on the othe hand, is imported. It seems important t concentrate more upon making the best possible use of our natural products than t develop better uses for an imported article

Elsewhere (he continued) it has been m duty to survey in some detail the world' coal resources, and the subject is not fre from difficulty. The gross amount of th mineral which geologists call "coal," in an part of the explored world can be estimate with some degree of accuracy. But, to th

NOTABILITIES AT ST. ANDREWS

Dr. Gustav Egloff


Dr. R. Hill


Dr. Per-olof Kinnel

practical man, this is not exactly what is wanted. It is more pertinent to demand a figure representing the quantity of good-quality coal which can be produced and brought to the market where it is wanted, at a cost which can compete economically with other sources of heat, light and power. Judged by this standard of measurement, geologists' figures fail to be drastically reduced.

Unfortunately, the standard of measurement may vary from time to time, according to industrial and economic conditions, so that the best estimates must be vague and elusive and subject to correction and reconsideration periodically.

New Survey

A more careful survey of the coalfields of this country is now being made. Reports on certain districts have already been published, and it will be possible in the near future to give an aggregate figure more accurate than ever before, representing the workable coal reserves of Great Britain as a whole. Whether this figure will indicate that the reserves will last for hundreds or for thousands of years at the present rate of consumption, it can be taken that the reserves of workable coal are still very considerable and cause no disquietude.

British coal reserves from the carboniferous formation can likewise be relied upon as to quality. It must, naturally, be recognised that the best quality coal is becoming scarce, particularly certain grades such as gas and coking coals. To counter this difficulty, means have been devised for producing gas and coke from grades which at one time were regarded as second-class. Further, for certain modern scientific purposes, coals which are found to give best results are by no means those which formerly were regarded as being of first-class quality generally. It may be that some coal seams which produced best coal for the drawing-room grate, or other purposes likely soon to be superseded, may equally soon be exhausted. In general, however, Great Britain has coal resources of a quality at least equal to the best the world contains.

This part of my remarks may be summed up in the statement that in regard to quality and quantity, the coalfields of Great Britain can be relied upon to justify long-term planning, involving enormous capital expenditure if need be, and that in regard to coal supplies, scientists and capitalists alike need have no fears for the future.

Utilisation of Coal

No one who has observed the progress of events during the past generation and who has witnessed the amazing achievements of science in recent years, would close his eyes to the possibility that new sources of energy may become available, reducing the importance of coal as a source of heat, light and power.

The progress of modern scientific research, on the other hand, has increased and developed the possibilities of coal, not as a source of heat and energy, but as raw material for a wonderful range of derivatives some of which will be discussed in the course of these meetings. Coal has been and still is the foundation of our industrial life. As old uses may disappear, new demands will be found, and there is every indication that coal may increase in importance, rather than diminish.

While, therefore, we may regard our coal resources as both valuable and plentiful, a great responsibility rests upon us to see to it, in our generation, that we make the best possible use of the reserves, remembering that they are exhausting assets and every ton consumed can never be replaced.

No industry is so full of interest as the coal industry. Every seam differs from every other, presenting special problems, and it may be special dangers to the mining engineer. The actual coal produced from every seam differs from that produced from every other seam, and presents new problems to the fuel engineer and the chemist.

Traditional Export

In the past, British coal was in demand in every part of the world. It heated the palaces in St. Petersburg, Rome and most European capitals. It supplied all the gasworks in Northern Europe. It coaled ships in most coaling stations between Valparaiso and Port Said. The coolies in Shanghai and the fellahín of Egypt alike warmed their bony fingers round braziers charged with coal from this country. Even in the year before the recent war (1939), the exports of our coal to all parts of the world approached 38 million tons.

This glowing picture will, however, fall into insignificance compared with that likely to be produced in future, when coal, in the hands of the scientist, will produce more and more materials, such as rubber better than that produced in the islands of the East, fibres finer than the produce of the silkworm. colours to compete with the rainbow, and curative medicines better than any yet produced for the alleviation of human pain.

While in the industry, it was my duty to investigate the various proposals for treating coal with the object of producing derivatives, from the business viewpoint, and I regretted to find that none contained sufficient promise of profit to warrant economic exploitation. The third report of the "Oil from Coal" Committee appointed by the Scottish Colliery Owners, indicates that the committee came to a similar conclusion in 1937. I very much hope that in future this will be changed and that processes will be devised which will be self-supporting economically.

Direct subsidies should be confined to the experimental stage, and to be successful, any process should be capable of making a profit at a price for the product which consumers are willing to pay, and that after paying wages to labour and interest to capital.

It may be good policy that import duties be levied for a time to encourage development, but as a final position it is hoped that ultimately processes may be devised which will be able to produce the derivatives at such a cost as will not only enable them to be supplied in this country without the shelter of import duties, but also permit their export to foreign countries in the face of world competition. For my part, I hope this phase of the question will be fully discussed before these meetings finally terminate.

Major Kenneth Gordon, of Imperial Chemical Industries, spoke on the production of petroleum by synthetic methods and Professor W. M. Cumming, of the Royal Technical College, Glasgow, presented a paper on " Coal as a Chemical Raw Material " (reproduced below). Professor W. T. Astbury, in the evening, spoke on " The Evolution and Physical Interpretation of Synthetic Fibres."

On Tuesday, Dr. D. T. A. Townend, director of the British Coal Utilisation Research Association, read a paper on " Modern Coal Gasification Developments," in which he spoke about the little known recent British work in this field. He pointed out that it was two British chemists who first drew attention to the commercial aspects of gasification of coal. The latest British work, he observed, has advanced to the point where batches of 300 lb. of coal are being treated on a semi-commercial scale.

Coal, Shale and Petroleum as Sources of Chemical Products

by Prof. W. M. CUMMING

IN this country, coal and the liquid products derived therefrom have been the source of our organic raw materials for the last hundred years. For this reason development in the field of organic research and in the organic chemical industry has been mainly on the aromatic side. On the other hand the development in America within a much shorter period has been based on petroleum and so far as industrial research is concerned has been largely confined to the aliphatic side. On the Continent still more recently, where the main source of fuel was synthetic oil, the development has likewise been in aliphatic chemistry.

There is, therefore, this inherent difficulty in the United Kingdom that, apart from minor petroleum deposits and a certain amount of natural gas, we are confined to developments based on coal where normal methods of carbonisation are applied. This can be modified to yield the lower aliphatic hydrocarbons; but another source of aliphatic compounds is required, which gives importance to the possibilities of acetylene, from hydro-electric schemes or the controlled oxidation of paraffins, as a basic raw material. Manufacturing processes based on acetylene cannot much longer be delayed if this country is to retain its position in the chemical industry of the world.

Recent developments of a similar kind in the U.S.A. have shown how paraffins can be cyclicised so as to yield aromatic hydrocarbons. From petroleum, therefore, both of the main raw materials are available, which gives oil-producing countries considerable advantage in the new era.*

The subject to be covered is of enormous proportions and time will allow of only brief reference to the more important advances with the aim of giving a general picture of the place those industries have occupied in the past in providing the essential raw materials of the chemical industry both here and in America, and of the ever growing im-

The author

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* Coal has been developed mainly on a national basis, oil mainly on an international basis.

portance of the future rôle which they must play in the development of industry in general, particularly in the United Kingdom.

Coal and its New Derivatives

Coal is undoubtedly our most important industrial asset and while its main function in the past has been as a source of power and heat, a function which it will continue to fulfil in the future to a considerable extent, it is our only abundant source of carbon, and, therefore, the basis on which our organic chemical industry must be built. Within recent years there has arisen a growing demand for aliphatic chemicals for the newer industries, plastics, synthetic rubber, artificial fibres, lubricants, synthetic fuels, etc., and these, of necessity, must largely be, and can be, provided by coal and its products.

The direct conversion of coal into organic products by simple reactions has been confined mainly to controlled oxidation. When coal, preferably cleaned by methods such as froth flotation or acid treatment, is oxidised at 220°C. by means of oxygen or at 300°C. by means of air, the reaction rate being controlled by the addition of 10-50 per cent of steam, very reactive products are formed, which combine easily with sulphur to yield carbon disulphide, a substance important enough on its own account, but which is largely used in the manufacture of carbon tetrachloride. Oxidation of coal in liquid suspension either in nitric acid or in alkaline medium by means of gaseous oxygen produces a mixture of acids (mellitic, pyromellitic or picric) which finds application as a base for resins and lacquer. If these acids are esterified, the esters form useful plasticisers for the manufacture of Buna rubber, while if the esters are in turn etherified, the oils produced are suitable as lubricants.

The industry which processes coal on the largest scale is undoubtedly the carbonisation industry in which coal is distilled, generally above 1000°C. or at temperatures very little above the plastic range of the coal, usually in the region of 600°C. The practice of low temperature carbonisation in this country has been comparatively limited but developments have been made. In the high temperature section of the industry, as practised in gas works and coke oven installations, suitable coals or blends are carbonised to give three main primary products—coke, tar and gas. The coke is comparatively non-reactive, the tar is essentially aromatic in nature and the gaseous hydrocarbons are of a relatively simple aliphatic type although a little benzene and toluene may be extracted by suitable means

Coke

Since high temperature coke has a low reactivity, processes for its conversion into more useful chemicals are usually of a vigorous nature and, in general, involve the conversion of the carbon into some other relatively simple organic compound which can then be caused to react to form the desired products, *i.e.*, in two stages. An important example of this type of successive reaction is furnished by the Fischer-Tropsch synthesis. Water gas contains the primary gases in approximately equimolecular proportions but the proportion of hydrogen can be comparatively easily increased at the expense of the carbon monoxide to furnish the gas ratio best suited to the process. After suitable adjustment in composition the synthesis gas can be converted into such diverse products as methanol, aliphatic acids and hydrocarbons, and ultimately even into edible oils. The various aspects of the Fischer-Tropsch synthesis, however, will be discussed later during this conference.

Coke is also the primary material for the preparation of hydrogen for the many hydrogenation processes, although alternative sources of hydrogen are available in certain cases. Once again water gas is the intermediate product in its conversion into hydrogen. In this case the carbon monoxide is removed as carbon dioxide by water scrubbing under pressure. Included in the products of hydrogenation are methane, petrol, hard fats and ammonia, all of which are of great importance in the present national economy.

Coal Tar

The coal tar produced by high temperature carbonisation has for long been a fruitful source of many aromatic intermediate products for the dyestuffs and pharmaceutical industries. Previously, practically all the benzole produced in this country was obtained by the distillation of coal tar, but modern technique, governed largely by wartime requirements for benzole, has developed to such extent that to-day a much larger proportion is recovered from the carbonisation gases than from tar distillation. It is of interest to note that the annual production of crude benzole in the United Kingdom is approaching 100 million gallons.

In Scotland the tar distillates industry, now handling about 206,000 tons annually, may be claimed to be as efficient as in any other part of the country. The industry may be said to have originated with Lord Dundonald's process, patented in 1781. In 1845, almost synchronising with Hofmann's work on light tar oils as a source of benzene, James Ross commenced the manufacture of boiled tar in Falkirk, the main outlet for his product being the local shipbuilding industry. Several firms followed and by the completion of the century all were absorbed under the title of Scottish Tar Distillers which now handles over 75 per cent of the crude tar produced in Scotland, excluding the production of the Glasgow Corporation Gas Department.

Possibly the greatest single development in the processing of crude tar was the introduction of the Wilton pipe still which was the forerunner of the modern pipe still. The Beckton Works of the Gas, Light & Coke Co. saw the first experiment in its use, and between 1940 and 1943 three modern pipe stills were introduced into the Scottish tar industry. These stills enable the distillation of the crude tar to be carried to pitch, which is recycled, with a much closer and more efficient fractionation than is possible in the old batch still. The products, moreover, are of a purity requiring little or no refining.

Phenols

The war and industrial requirements for benzene, toluene and naphthalene were easily met and the developments of the plastics industry concentrated attention on the phenols. To-day pure phenol (m.p. 40° C.), pure ortho cresol, xylenols, and higher boiling phenols can be provided, all exported to the south, while pitch, creosote, etc., are available for normal use. Mention should be made of the recovery of pyridine and its homologues in a high degree of purity.

Coal tar has always been regarded as a veritable storehouse of organic chemicals and the number of aromatic compounds now capable of isolation in technical quantities and of comparative purity is rapidly increasing. The isolation of benzene, toluene and xylenes from the lighter fractions has long been established and modern methods of azeotropic distillation have resulted in the separation of these products in a highly purified condition. The use of these hydrocarbons as dyestuffs intermediates is well-known, and their application to synthetic medicinal products is continually extending.

Typical examples of newer developments in the application of these hydrocarbons on a technical scale are the production of the new insecticides gammexane (benzene hexachloride) the gamma isomer of which has such remarkable insecticidal property, and DDT (dichloro-diphenyltrichlorethane), while on the Continent in pre-war days, the manufacture of xylene musk (butyl trinitro-*m*-xylene) was carried out in at least one of the German tar distillation works.

Many of these aromatic compounds isolated in quantity from coal tar by distillation and other methods of separation have found application as plastics intermediates. It has been estimated that the coal tar distillation industry could provide about 70 per cent of the plastics industry's requirements of such intermediates, chief among which is, of course, phenol. The polyamide type of be manufactured from benzene by way of synthetic fibre, represented by nylon, may hexamethylene diamine and adipic acid. As an example of the use of one of the minor constituents, carbazole is now used in the preparation of polyvinylcarbazole plastics.

Indene

Two compounds isolated from coal tar, coumarone and indene, each capable of polymerisation, have received a good deal of attention within recent years. These occur in the naphtha fraction and the problem of their isolation by means other than fractional distillation has been solved in several ways. On the Continent indene, for example, has been isolated by (a) crystallisation of the picrate and subsequent liberation of the hydrocarbon by steam distillation; (b) formation of sodio indene followed by steam distillation, and (c) azeotropic distillation. Two methods have recently been described in this country which yield indene of high quality from commercial naphtha. In the first, indene is condensed with ethyl oxalate in alcoholic solution in presence of sodium ethoxide to give indenyl-1-glyoxylate which may be removed from heavy naphtha by solution in caustic soda solution, while in the second, by absorption in hydrogen chloride to give 1-chlorhydrindene which can be comparatively easily separated from the naphtha by distillation. The chlorhydrindene is refluxed with sodium carbonate and steam distilled to regenerate the indene.

The replacement of picric acid largely by T.N.T., etc., in the 1939-45 war diverted attention in this country from synthetic phenol, which was made in such large amounts in the 1914-18 war. But phenol is now one of the important materials of the chemical industry and for a number of years the ever-widening demands of the plastics industry have made the phenol position extremely acute. There are ample supplies of benzene available from gas works and coke ovens and the war period has left us with an over production capacity of sulphuric acid. It is difficult to understand the delay in setting up synthetic production again. There is probably little to choose between the chlorobenzene (Raschig) process and the sulphonation (Kohatenur) process on economic grounds. The choice would depend on availability of raw materials and disposal of by-products. An additional source of phenol could be developed by extraction from gas liquors by means of solvents such as tricresylphosphate, phenosolvan (butyl acetate with small proportion of amyl and propyl acetates) or benzol, or by absorption with activated carbon.

Coal Gas

Gas formed by straight high temperature carbonisation of coal is essentially aliphatic in nature. Such gas will form the major source of these chemicals unless oil refining is practised on a larger scale in Britain.

Straight coal gas (*e.g.*, coke-oven gas) has the following approximate composition:—

Butylene	0.05 per cent
Propane	0.15 ,, ,,
Propylene	0.40 ,, ,,
Ethane	0.85 ,, ,,
Ethylene	2.50 ,, ,,
Methane	28 ,, ,,
Hydrogen	50 ,, ,,

the remainder consisting of oxides of carbon, oxygen and nitrogen. These hydrocarbons, as also the hydrogen, constitute a valuable source of raw materials for aliphatic synthesis such as have been developed in the U.S.A. Isolation of the hydrocarbons from coke-oven gas has been largely practised on the Continent. Coke-oven gas is more suitable than coal gas for the separation of the hydrocarbons for two reasons. The average composition of the gas is remarkably constant and removal of the hydrocarbons presents no great difficulty, provided the gas is not supplied to a gas company operating on a declared calorific value. In addition the supply is not dependent on seasonal demands.

Case for Ethylene

On account of its high concentration it would appear that the most desirable hydrocarbon for isolation would be methane, but this gas is by far the most difficult to convert into useful derivatives. Consequently the isolation of ethylene presents certain attractions although it is present in a concentration less than one-tenth that of methane, and this is done by at least one plant in the south. A coke-oven plant with a throughput of 1000 tons of coal per day would produce some 10 tons of ethylene, at least half of which could be recovered. Conversion into some transportable intermediate such as glycol or even into polythene would appear to be an economic possibility.

Extraction methods are based usually on one or other of three techniques (a) scrubbing with benzole under pressure, (b) adsorption on active carbon under pressure or (c) liquefaction. If the separation of both methane and ethylene were carried out at coke-oven plants, the methane isolated would compensate, at least in part, for the lack of a carbide industry in this country, since methane can be converted into acetylene by cracking in the electric arc or by controlled oxidation. Separation of these gases would thus lead to a supply of methane, ethylene and acetylene, and at the same time leave a gas rich in hydrogen for hydrogenation processes, including ammonia synthesis.

The gas derived from the externally heated retort is richer in hydrocarbons than straight coal gas, and if the process were to be operated on a greater scale, provision could be made for the recovery of a considerable proportion of the gas composed to the extent of 10 per cent of paraffins from ethane upwards.

The tar, which amounts to some 9 per cent of the weight of coal carbonised, consists of paraffinic, olefinic, aromatic and naphthenic hydrocarbons, phenols and bases. Distillation effects a preliminary fractionation into motor spirit, solvents, diesel oil, oil for coal flotation, plasticisers, etc. The phenols, mainly higher homologues of phenol, are not separated, and by such methods as chlorination, are converted into efficient germicidal products.

Complete Gasification of Coal

The principal object of the complete gasification of coal is the production of gas of high calorific value as opposed to the low calorific value gas of the air-blown producer. Such a process would provide an alternative to carburetted water gas for boosting purposes, the gas oil being thus liberated for chemical purposes.

Several methods of complete gasification of coal or coke are available, for example, on the Continent by means of oxygen under pressure by the Lurgi and Winkler methods, by the Fischer-Tropsch methane synthesis over a nickel thoria catalyst, and by the method of the Gas Research Board, direct synthesis of methane by catalytic hydrogenation of coal or coke. This last reaction takes place with great rapidity. Such a process provides a ready source of methane for enriching gas, as a standby gas, or compressed or liquefied for use in internal combustion engines, and can, of course, provide a raw material for organic synthesis.

Hydrogenation

Hydrogenation of creosote is much more straightforward and less costly than hydrogenation of bituminous coal and on this account will possibly become the process of the future. It is flexible enough to produce paraffins or aromatic compounds as required but so far has given no lubricating oil. Depending on the conditions some 10 per cent of the feed appears at the conclusion of the reaction in the form of paraffins rich in butane which are used in the manufacture of synthetic fuels of high octane ratings. Typical examples are iso-octane (2.2.3-trimethylpentane), tryptane (2.2.3-trimethylbutane) and victane (butylbenzene).

It is to be hoped that at the next conference the important place that certain components of the crude oil and of the unsaturated gases could hold in the chemical industry will receive acknowledgement.

Petroleum

At the present time, petroleum is providing 30 per cent of the world's requirements of energy and, it is probable that this percentage will increase. Of the grand total of crude petroleum produced in the U.S.A. only 1 per cent is utilised for chemical purposes. While this small proportion represents an enormous organic chemical industry, for many years to come petroleum or the main fractions derived therefrom must be regarded as a source of energy, not primarily of chemicals.

Industrial separation of fairly pure hydrocarbons from isomeric groups can be readily effected up to the pentanes, but above this increasing difficulty is experienced. Not only the complexity of the petroleum fractions but also our lack of knowledge concerning their constitution and the chemical reactions of their component hydrocarbons militates against their utilisation. Until we know more about the higher hydrocarbons it will not be possible to utilise them successfully as a source of synthetic organic chemicals.

For this reason, therefore, attention will be devoted here to the utilisation of natural gases and gases or volatile liquids produced in the refining of the crude oil. The utilisation of the liquid fraction of the Fischer-Tropsch hydrocarbons for the production of fatty acids by a carboxylation process (oxidation of hydrocarbon with air in presence of potassium permanganate at 150° C.) and of detergents of the sulphonamide type (action of sulphur dioxide and chlorine on hydrocarbons in presence of ultra violet light), shows, however, the considerable possibilities for the production of chemical products inherent in the fractions which constitute the more important fuels of the present time.

Oil and Gas in U.K.

It is of interest to mention the home production of oil and gas, particularly during the war years, since the information has only recently been made public and represents a remarkable achievement. Drilling commenced in 1934 in Hampshire, and by 1939 a small shallow seepage type of oil-field had been discovered in Lancashire and another in Nottinghamshire. During the war 380 wells of varying depth had been drilled, 250 of them producing wells. The total effort had required 735,000 ft. of drilling, the average speed being about 32 ft. per hour, and the result to 1945 represented 2.25 million barrels of good quality crude of the paraffin and intermediate base types. The motor spirit and aviation distillates have good anti-knock characteristics and naphthenes predominate. The paraffin wax content is more than double that of an average mid-Continental crude.

Natural Gases

The principal gases and low boiling liquids available from all oil wells and from petroleum refining are principally paraffins containing one to five or six carbon atoms, principally straight chain. These gases which at one time constituted a problem in disposal now provide many hundreds of compounds of the greatest industrial importance. Meanwhile, practically every operation and technique known to the organic chemist have been applied, such as: oxidation, halogenation, nitratic sulphonation, dehydrogenation, amination, reduction, acetylation, diazotisation, hydrolysis, Friedel-Crafts, hydration, esterification alkylation, polymerisation, pyrolysis, resinification, isomerisation, cyclicisaton (aromatisation).

Ethylene

The reactivity of the olefines suggests that they will become the basic raw materials of the future organic chemical industry and an enormous amount of work, both theoretical and practical, has been carried out on ethylene. By controlled oxidation it can be made to yield ethylene oxide and the well-known water miscible solvent dioxan, and by processes of the OXO type (CO and H_2 under pressure) to yield aldehydes and acids. Its condensation with benzene to give styrene has led to the polystyrene plastics, while in its co-polymerisation with butadiene the buna rubbers are formed. Its polymerisation in presence of a small trace of oxygen at about 200° C. and 2000 ats. to give polythene is one of the most outstanding technical achievements within recent years.

Acetylene

Acetylene will probably become the other basic raw material for synthetic organic industrial processes and possibly in the not far distant future. It is not fifty years since its production from carbide was first patented, and it has been produced at intervals in this country on a small scale for almost half a century.

Carbide

Calcium carbide would naturally be allied to the manufacture of calcium cyanamide, although this has not been done so far in this country. Apart from its use as a fertiliser, it is readily converted by sulphuric acid into dicyandiamide, which with ammonia under pressure yields the newer resin, melamine, when condensed with formaldehyde. This resin became available commercially during the last war.

When supplies were cut off during the war a factory was erected at Port Talbot in South Wales with an output of 80,000-90,000 tons of carbide per annum, a figure which exceeds our pre-war demand for engineering purposes. Three furnaces were provided with a nominal rating of 15,000 kW, each capable of about 100 tons per day throughput.

Cracked Gases

In order to make more economic use of crude petroleum and to meet the demands for improved quality fuel for motor car engines, the cracking process was introduced during the 1914-18 war. The net result was the utilisation of the major proportion of the crude spirit in place of 10 per cent by straight distillation. The octane number and in consequence greater efficiency with higher compression ratio, was increased in the average by 20 units. The amount of cracked spirit increased with leaps and bounds until to-day it may be claimed to have reached 75 per cent of the total production.

This development was responsible for one almost equally important in the field of organic synthesis. Apart from the complex structural changes that took place in the molecule by the heat and pressure treatments, the gases always liberated, and in particular olefines, so far available only in the natural gases, became available in prodigious amounts. Furthermore, the composition of the gases could be controlled by altering conditions. The net effect then of the introduction of the cracking process was to enlarge many fold the chemical industry which had centred in the natural gases.

Synthetic Fuel

In the U.S.A. the enormous quantities of natural gas consisting mainly of methane have possibly diverted American attention from the original Fischer-Tropsch process of preparing synthesis gas from coal to one with methane as the basic raw material. In any case, American coals are largely anthracitic and in this respect less amenable to the normal Fischer-Tropsch procedure. Of the three methods of preparing synthesis gas, *i.e.*, CO and H_2 in the proportion of approximately 1 to 2, the ultimate decision depends on the availability of other gases, for example, hydrogen. Most work has been done on the steam reaction but theoretically the most attractive process is the exothermic, controlled oxidation, provided a cheap supply of oxygen is at hand. Using two parts of methane to one of oxygen with a fluid alumina-silica catalyst the standard synthesis gas is available. This process is now being worked in U.S.A. It is claimed that oxygen can be produced for 10s. per ton. The process is, therefore, most attractive for other synthetic processes. As well as liquid hydrocarbons, the lower alcohols, ketones, etc., are produced and remain in the water phase from which they can be recovered by distillation.

It is to be regretted that no large scale experiments in the Fischer-Tropsch process have been attempted in this country. As far back as 1936 the Oil from Coal Committee of the Scottish Development Council urged the erection of such a plant which could have been operated on coal or in conjunction with cannel. It must be remembered that in 1946 we imported almost 500 million more gallons of petroleum products than in 1945, an increase of 11.3 per cent.

Oxidation of paraffin wax has been chiefly investigated for the production of fatty acids. It may be used for soap manufacture or even as edible fats. Although patents for such processes were taken out by Schaal in 1885 progress expected does not seem to have materialised. The acids produced are extremely complex, including less valuable hydroxy acids, but appear to offer some promise in manufacturing processes. They are being manufactured for improving the oiliness of lubricating oils.

Sulphonic and Naphthenic Acids

Sulphonic acids produced in the refining processes, particularly in the manufacture of highly refined medicinal paraffin, have been investigated in Germany and in Russia. They have been found to possess value as detergents and emulsifying agents. We still await knowledge as to their constitution, although some progress has been made in this direction. Naphthenic acids present to about 1 per cent in Russian and allied crude petroleums and to a smaller extent in most American crudes, are extracted during refining, especially of the lighter distillates, with a soda wash. These acids are used in the manufacture of soaps and their value as emulsifying agents has been enhanced by the introduction of their sulphonated derivatives. Their copper salts have proved of value as fungicides and wood preservatives, whilst cobalt, manganese and lead salts, have been used as paint driers.

This rapid and sketchy survey gives a general view of the application of coal, shale and oil as raw materials for the chemical industry. It postulates the great advantage of those countries which are fortunate enough to have rich oil deposits. At the same time it emphasises the opportunities opened up in a country such as this where the basic material is coal. Enough has been said, it is hoped, to show that there are still great potentialities in the utilisation of this as a source of carbon for synthetic purposes. With an increase in oil refining and encouragement to our oil-bearing minerals industry the way can be paved for great development. If to this is added the production of acetylene by hydro-electricity or oxidation of paraffins, then the way is opened for a new chemical industry such as Scotland has not before witnessed in its long and distinguished history.

In a paper on "Coal as a Chemical Raw Material," by Professor W. M. Cumming (given more fully in later pages) emphasis was laid on the opportunities in a country such as this for the utilisation of coal to provide carbon for synthetic purposes. The way is thus open, the author thought, for a new chemical industry.

Fischer-Tropsch Process

Dr. C. C. Hall, director of the D.S.I.R. Fuel Research Station at Greenwich, on Tuesday spoke on "The Fischer-Tropsch Process as a Source of Synthetic Products."

This process, he said, may be used for the conversion of coal into liquid fuels, or into a variety of aliphatic products which are otherwise unobtainable or obtainable only from natural sources. It is only the latter application of the process which is of immediate economic interest in this country. The process is a particularly suitable source of the following types of non-fuel product.

(i) Hydrocarbon waxes of a range of melting point and hardness obtainable directly from the primary products.

(ii) Lubricating oils of high viscosity index obtained by further processing of the primary products.

(iii) Long-chain alcohols obtained directly under special process conditions or as secondary products by the hydrogenation of aldehydes prepared from the primary products by the OXO reaction. These aldehydes are also valuable products.

(iv) Fatty acids present to a small extent in the primary products but preferably obtained by the oxidation of the higher fractions of the hydrocarbon product or of the aldehydes and alcohols obtained via the OXO reaction.

(v) Detergents obtained by sulphation of the primary olefines or of the long-chain alcohol obtained as in (iii), or by sulpho-chlorination or sulpho-oxidation of the long-chain primary paraffins.

It is possible, Dr. Hall thought, to operate the process so as to produce materials of the above types as a major proportion of the whole output and liquid fuels became relatively minor by-products. Under such conditions, the process should be commercially economic in this country.

Acetylene Chemistry

Professor E. R. H. Jones, who read a paper on "Acetylene Chemistry," said much interest is now being evidenced in this subject partly as a result of the revelation of German researches in this field during the past ten years and partly because of the *growing realisation of the potentialities of* acetylene and acetylenic compounds as starting materials for organic syntheses, not only in the laboratory but also on the industrial scale. No treatment of acetylene chemistry, he said, would be properly balanced without reference to production and a discussion of this aspect is particularly opportune in view of the present coal and electricity supply position in Great Britain. Carbide remains the main world source of acetylene, but processes involving electric arc treatment, partial oxidation or thermal cracking of hydrocarbon gases are receiving increased attention. Notable advances have also been made relating to the use of acetylene under pressure.

A survey of the well-known applications of acetylene in the organic chemical industry includes its conversion into acetaldehyde, halogenated ethylenes and ethanes, vinyl esters and ethers and the more recently developed process for the production of butynediol ($HOCH_2.C/C.CH_2OH$), leading to tetrahydrofuran and butadiene. The future development of these and other processes is, of course, intimately connected with the alternative routes to acetylene mentioned above, since a cheaper raw material would undoubtedly make many such processes more attractive.

Professor Jones remarked that the accidental discovery of the remarkable conversion of acetylene into cyclooctatetraene in the presence of nickel cyanide has opened up a bright new prospect for the organic chemist and the formation of acrylic acid and its derivatives by carbon monoxide condensations appears to offer a simple alternative route to syntheses based on ethylene. These and other reactions in the development stage will be discussed and more academic researches now in progress will be outlined.

Some outstandingly novel and potentially important industrial uses of acetylene have been revealed and the eyes of organic chemists have been strongly focused on what is still a relatively unexplored field. Undoubtedly much more remains to be discovered and there is ample scope for imaginative fundamental investigations on acetylene and its simple derivatives.

Mr. J. H. Brown, of Imperial Chemical Industries, speaking on vinyl compounds, noted the dependence of modern synthetic chemistry on oil and coal. In his paper (given more fully elsewhere) he said that all routes to the vinyl compounds pass through the key intermediate acetylene via coke and carbide.

(Other important contributions to the St. Andrews symposium will appear in succeeding issues.)

CHEMISTS' COLLOQUIUM IN DUBLIN

(From Our Dublin Correspondent)

A COLLOQUIUM under the auspices of the Irish Chemical Association and the Royal Institute of Chemistry was held this week in the College of Science, Dublin, and was attended by industrial chemists and scientists of distinction from Britain, Eire, and Sweden. The Colloquium dealt with the industrial utilisation of agricultural products and seaweed. It was preceded by a reception given at the Shelbourne Hotel by the Irish Sugar Co. The guests included Mr. Sean Lemass, Minister for Industry and Commerce; Dr. A. G. G. Leonard, chairman of the Dublin Section of the Royal Institute of Chemistry; Prof. J. B. Spearman, D.Sc., F.R.I.C., F.T.I., Professor of Textile Industries at Leeds University; Prof. J. L. Simonsen, D.Sc., F.R.I.C., F.R.S., director of the Colonial Products Research Council, London; Prof. E. L. Hirst, D.Sc., F.R.I.C., F.R.S., director of Chemical Laboratories, Manchester University; Dr. Beckman, Sweden; and Prof. T. S. Wheeler, D.Sc., F.R.I.C., Professor of Chemistry, University College, Dublin.

Aid to Agriculture

Mr. Lemass, describing agriculture as the main industry of Ireland, the foundation of the national economy, and the principal internal source of industrial raw material, said that his country had a lively interest in the possibilities of seaweed.

Prof. Spearman described the process by which rayon fabric can be produced from a new seaweed fibre. These fabrics, of which he showed samples, are now being produced in England. The west coasts of Scotland and Ireland were the best sources of the raw material.

Sugar, Cellulose and Starch

On the subject of "Agricultural Products and the Chemical Industry," Professor Simonsen, London, stated that the carbohydrates (cellulose, starch and sugar) provide the greatest possibilities among the raw materials available for industrial use and that future development would inevitably be based upon them.

Prof. E. L. Hirst, Manchester, declared pure sugar to be a potential starting point for an organic chemical industry. As a consequence of the Birmingham researches of Haworth and Wiggins, such products as nylons, plastics, sulphanilamides and methyl acrylate could be synthesised entirely from sugar.

Dr. G. Van Der Lee, D.Tech,Sc., managing director of the *Company Ceimici Teox*, recommended that potatoes should be "grown specially for industry," their price being determined by the percentage of starch. In pre-war days Eire imported the equivalent of 30,000 tons of potatoes per annum in the form of potato products. In the course of the discussion it was stressed that seaweed made it possible to strengthen wool and other materials so that they can be woven more finely than ever before.

GERMAN CHEMICAL PLANT

THE authors of B.I.O.S. Final Report No. 426, Item Nos. 22 and 31 refer to the difficulty in obtaining accurate information from a company known as Maschinenbauanstalt Venulth & Ehrenberger, A.G., Darmstadt, because the records were reported to have been entirely destroyed when the works were bombed. It is clear, however, that although this company—which had an annual war-time turnover of more than Rm. 2 million—possess details regarding the chemical processes in which they have been used. It appears that the manufacture of atmospheric and vacuum drying machines of various types, covering a wide range of inorganic and organic chemicals, was a speciality of this firm, which also manufactured evaporating plant, mixers and mixer-dryers. At the time of the investigation, the machine shop, which alone had been reconstructed, was used for repairing damaged plant for the rest of the works. Production could therefore recommence as soon as the other buildings were rebuilt. The factory operated entirely on electric power, and normally employed about 200 persons. The spray dryer, which is one of the chief products, seems to have been of orthodox construction. It was used extensively in the food and dairy industries for separating sulphite lye from wood pulp, and for making dyestuffs and their intermediates. For various sensitive materials, drum dryers (both atmospheric and vacuum) were produced, but the investigators failed to discover any unusual features. A number of machines for testing materials were found in a special experimental unit.

A large jacketed rotary dryer examined had been designed to I.G. (Ludwigshafen) specifications, the cylinder being 12 ft. in depth and 3 ft. wide. The heating medium passed through the shaft to the inside, where it was distributed to the jacket by an internal pipe.

FEW GERMAN CHEMICAL EXPORTS

Acute Raw Material Difficulties

HOPES that the chemical industry would make a major contribution to the exports from the combined Anglo-U.S. zone of Germany have so far been disappointed. In the important Hesse region, with the big manufacturing centres of Hoechst, Darmstadt and Frankfurt, Mr. Leon Mandell, head of the Export-Import Department of U.S. Military Government, has reprimanded chemical manufacturers in general, and the I.G. Farben works at Hoechst in particular, for failure to co-operate in the export drive.

Chemical exports were slow because manufactures were either hoarded or used for "compensation" deals—*i.e.*, for exchange against goods of other industries—inside Germany. Mr. Mandell revealed that an investigation has been initiated and that drastic measures are to be taken in future to prevent hoarding.

Meanwhile, the U.S. authorities have concluded a contract with the Soviet zone for the purchase of 100,000 tons of potash salts—one-third of the estimated export surplus of the current year—for shipment to Japan. Salt is another important export item, and substantial quantities are being shipped to Norway and Sweden. But shipments of other bulk chemicals are very small indeed. During the first quarter of 1947 exports from the Anglo-U.S. zone included no more than 104 tons of caustic soda, valued at $5497, percussion caps worth $97,854, and artificial fertilisers worth $23,460.

Lack of Materials

Raw material shortages are given as explanation for the failure of chemical factories to achieve large-scale production. Apart from the lack of coal, which is responsible for frequent interruptions of production, imported raw materials are also causing difficulties. End-of-war stocks were exhausted some time ago. A slight improvement may be expected under recent arrangements for processing of foreign raw materials by German firms against part payment in kind. Thus Duisburger Kupferhütte last month received the first two cargoes of burnt pyrites to be treated under contract with Rio Tinto Co. and will retain part of the metal obtained in lieu of other payment.

Despite raw material and labour difficulties, a number of chemical factories have been able to resume operations or start new productions. The I.G. Farben works at Uerdingen has enlarged its raw material production programme for dyestuffs and pharmaceutical manufactures. It will commence the production of raw materials for the soap industry and of methanol for drugs and plastics makers. Chemische Werke Rheinpreussen, the chemical works connected with the Rheinpreussen coal mine in the Ruhr, is also starting the production of raw materials for the soap industry, although only at one-third of capacity. Kali-Chemie A.G. has resumed the production of sulphur and barium carbonate at Hönningen and hopes to resume the manufacture of superphosphates. Union Rheinische Braunkohlen-Fraftstoff A.G. has received a permit for the production of 3000 tons of ammonia a month at the Wesselling works near Bonn.

Yeast from Wood

A factory near Hamburg is producing 120 tons of food yeast a month from wood chips by saccharification. At Brunswick a new company has been formed to produce yeast products and develop suitable processes for this purpose. Growing interest in the large-scale production of yeast for nutritional purposes is also reported from other zones.

In the eastern zone some of the most important works have been transferred to the Soviet electro-chemical combine, but this change in their status does not seem to have eliminated their raw material difficulties. At Wolfen, where I.G. Farbenindustrie owned large works for the manufacture of fertilisers, dyestuffs, photo-chemicals, cell wool and rayon, the production of artificial fibres is particularly handicapped because of the shortage of beechwood and sulphur.

"CHAOTIC STATE OF AFFAIRS"

(*By a Correspondent recently in Germany*)

GERMAN industry is now practically at a standstill with imports at a minimum; in fact the only imports are those required to provide the bare essentials of life. Germany is now a country of make-believe and false economy. Owing to shortage of supplies, many German chemical and engineering firms are operating inefficiently, while they vainly hope that the Control Commission will eventually do something to assist them. Possibly the majority of wages bills are being met from capital and not from the earnings of the firms themselves.

The visitor's impression is that Germany is a land with a thriving black market, where all production has its value in terms of cigarettes, tobacco or food. We have been informed that this irregular procedure has cost the British taxpayer the extra-

(*Continued on page 52*)

German and Japanese Industrial Reports

To date 2122 German Industrial Reports and 57 Reports on Japanese industry have been published. The latest of these reports, now obtainable from H.M. Stationery Office at prices indicated, include the following of interest to our readers.

BIOS 1049. German acetylene chemical industry. Acetaldehyde manufacture. (8s. 6d.).

BIOS 1141. German chemical industry with special refrence to the design of plant for dyestuff and intermediates. (20s.).

BIOS 1155. I.G. Farbenindustrie A.G.: The manufacture of sulphur dyestuffs and their intermediates at Mainkur (5s.).

BIOS 1297. The manufacture of laboratory chemical reagents in Germany. (5s.).

BIOS 1223. Iron powders and sintered components (9s.).

BIOS 1266. The testing of permitted explosives (Wettersprengstoffe) at the Testing Gallery, Dortmund-Derne and the Experimental Mine, Tremonia Str., Dortmund (6d.).

BIOS 1267. Testing and safety precautions in connection with industrial explosives (1s. 6d.).

BIOS 1272. Inorganic pigments. Synthetic iron oxides (6s. 6d.).

BIOS 1294. Textile waste reclamation (wool, rayon and real silk) (Part II) (1s.).

BIOS 1295. The production of certain types of phosphor bronze, brass and light alloy castings in Germany (1s.).

BIOS 1323. The production of powdered iron and sintered iron driving bands in Germany (10s. 6d.).

BIOS 1335. The fluorspar industry in Germany. Mines and treatment plants in the Nabburg and Regensburg Districts, Upper Palatinate (Bavaria) (6s.).

BIOS 1340. Report on glass fibre industry in Germany. (10s.).

CIOS XXXIII-41. Research on preparation and reactions of nitroparaffins. (1s. 6d.).

CIOS XXXIII-43. Hydrogen peroxide production at Hollreigelskreuth. Part II. Ammonium persulphate (all-liquid) process. (1s. 6d.).

CIOS XXXIII-45. Hydrogen peroxide production at Kufstein. (3s. 6d.).

CIOS XXXIII-46. Hydrazine hydrate and C-Stoff production at Gersthofen. (2s. 6d.).

CIOS XXXIII-47. Manufacture of sodium and calcium permanganate. (1s.).

CIOS XXXIII-59. German war list for ferrous materials (kreigsliste) (Appendix No. 17 to CIOS Report XXXII-119). (11s.).

FIAT 879. Notes on the peeling of nickel deposits (3s.).

FIAT 912. The manufacture of bile acids from ox bile (1s.).

FIAT 933. Reactions of carbon monoxide with acetylene, alcohols, cyclic ethers, to produce aliphatic saturated and unsaturated acids and esters (1s. 6d.).

FIAT 993. The aluminium reduction industry in Germany (2s. 6d.).

FIAT 1008. Losses due to evaporation and melting of the alpine snow cover prior to spring thaw. Report in German (1s.).

FIAT 1030 and 1031. The electron emission of crystalline metal surfaces and its relation to the laws of crystal structure. Parts 1 and 2. Report in German (3s.).

FIAT 1033. On the arrangement of the double bonds in hydrindene. Report in German (1s.).

FIAT 1086. An instrument for measuring the lateral pressure of monomolecular films. Report in German (1s. 6d.).

BIOS/JAP/PR/8. Production of active charcoal by Nihon Tanso Co., Ltd., Osaka, Japan (6d.).

BIOS/JAP/PR/19. Products and producing capacity of Mitsubishi Kasei Kogyo Kabulhiki Kaisha. (Mitsubishi Chemical Industries, Ltd., Japan (1s.).

BIOS/JAP/PR/662. Culture and utilisation of "Kozo" and "Mitsumata" for the manufacture of high-grade paper in Japan (1s. 6d.).

BIOS/JAP/PR/675. Oil fields of Hokkaido, Japan (2s.).

BIOS/JAP/PR/749. Lead-acid storage batteries used by the Japanese Navy (1s. 6d.).

BIOS/JAP/PR/833. Japanese fuels and lubricants. Fuel and lubricant technology. (7s.).

BIOS/JAP/PR/1164. Fertilisers in Japan. (5s. 6d.).

BIOS/JAP/PR/1453. Metallurgical examination of 5-in. Japanese Naval projectiles (6d.).

BIOS/JAP/PR/1444. Metallurgical examination of armour plate from Japanese Type IF "Oscar" Mark II S.E. Fighter (1s.).

BIOS/JAP/PR/1454. Metallurgical examination of Japanese army 47 mm. H.E. projectiles (1s.).

Technical Index. Alphabetical subject index of reports published up to and including July 27, 1946 (5s.).

Technical Index (Part 2). August, September and October, 1946. Supplement to the above Index (1s. 6d.).

FULMER RESEARCH LABORATORY

New Facilities for Individual Investigations

SIR STAFFORD CRIPPS last week opened the Fulmer Research Institute, Stoke Poges, Bucks, an establishment to which small and large industrial firms may send their research problems. The idea of such a laboratory originated with the managing director of Almin, Ltd. (Col. W. C. Devereux), who is chairman of the Institute's board of directors. The other members of the board, as constituted to date, comprise Mr. Spence Sanders, Mr. W. R. Merton, Mr. H. G. Warrington, and Mr. E. A. G. Liddiard.

An important feature of the undertaking, and one that is understood to be entirely new to the field of industrial research, is its non-profit making motive. Work will be chargeable at cost plus a small margin to contribute towards extension and development of the facilities of the Institute.

All work will be carried out in strict confidence. Should it happen that two concerns submit identical problems, the Institute will reserve the right to refuse the second, with or without explanation according to whatever arrangement may have been made with the first concern. In certain circumstances, however, subject to safeguards, the Institute would be prepared to arrange an introduction between two or more firms interested in the same problem with a view to lightening research costs. It is emphasised, however, that a "first come—first served" rule will be observed and no departures will be made without the consent of the originator.

At the present time the activities of the Institute are confined to the metallurgical field, but it is anticipated that some of the smaller chemical manufacturers without the necessary equipment at their disposal, will eventually come forward with their problems.

In a brief address at the opening, Sir Stafford referred to the valuable work carried out by research departments of the larger companies and by individuals, and said that the rising costs and complexities of research had had the effect of reducing the number of firms and private consultants engaged in this work. Since British industry depended upon research for its progress and vitality, it was important that the smaller and enterprising firm should have a service at its disposal on the lines of the new Institute. He hoped that one day they would emerge into a state of affairs where the scientific results of all research could be freely made available for the benefit of all, whatever its origin.

Inquiries from those seeking to make use of the new research service should be sent in the first instance to Mr. E. A. G. Liddiard, director, Fulmer Research Institute Limited, Stoke Poges, Bucks, from whom further advice may be obtained.

Sir Stafford Cripps examines a metal through a microscope in the metallography laboratory, while Dr. K. Hardy, of the Institute, holds a watching brief

Metal Mines and Postage Stamps

Designs Honour Metals and Metal Workers

POSTAGE stamp designers in all parts of the world have not failed to grasp the importance of metal industries, and they have produced some really striking works of art in miniature which the postal authorities of various countries have not been slow in accepting for the production of industrial stamp issues.

It is significant to note that British stamp designs surpass those of any foreign country in this particular field of artistic endeavour, providing in many instances a more vivid and appealing scene than those presented by contemporary authorities. For instance, the picture on the 3-cent (red) denomination of British Guiana, first issued in 1934, is full of life and intricate detail in its portrayal of alluvial gold mining.

Nigeria provides another excellent design in the 1936 issue of pictorial stamps in which the 1½d. (brown) value shows a fine picture of a tin dredger. As the higher values of the current series of this Colony's postage stamps carry the designs used in the earlier issue, it is quite likely that the authorities will fall back on this distinctive picture for future use.

South Africa's gold mine design was first introduced on the large 1½d. value in 1936. It was then very appropriately printed in green and gold. In 1941, this splendid picture was re-issued in a smaller size for stamps of the same denomination, but with the substitution of buff ink for gold. A fine study of electric welding was introduced on the 6d. (orange) value of the National Defence series of stamps released in 1941, and a year later this was also re-issued in a smaller size. The design is still in current use, and depicts a welder wearing a special protective suit and face-shield.

Among outstanding designs of foreign origin, there is one of a picture of the iron works at Moravska-Ostrava. This appeared in 1939 on the 4-krone (slate) value of a and Moravia.

Chile has favoured the issue of large sized stamps since the early days of its postal history. An attractive pictorial set produced in 1938 provided many industrial designs. The 40-cent (green) denomination shows an impressive scene of a copper mine, and the 50-cent (violet) bears a picture of petroleum storage tanks.

Russia has issued more stamp designs featuring metals than any other country, and these range from workers to blast furnaces and production graphs. In a number of cases these stamps carry a slogan in somewhat similar strain to that appearing on the 20-kopeck value of the 1929 issue, which reads "More metal, more machines!"

(*Continued from page* 49)

ordinary sum of £58 millions. But little else can be expected while there is a German food shortage, no work, and more cigarettes in the country than the British soldier of occupation can smoke. Germany, instead of paying for the war she created, is being supported by the British taxpayer—and all because German industry is unable to run efficiently.

When visiting German factories, one is impressed by the national desire and eagerness to work; there is probably a realisation that nothing is worse than enforced idleness. Nevertheless Germany is in the same state as were the depressed areas in this country in the early 'thirties. German labour costs are far lower than in this country, and in the present shortage they could help us by providing chemicals and machinery. It is to be hoped, therefore, that the Board of Trade's recent decision to allow some trading with Germany is evidence of practical steps in the right direction.

Britain may now purchase a certain amount of machinery of specialised types from America where production costs are fantastically high compared with those involved in the production of similar machinery in Germany. The effects on the purchase price and ultimately on British industry and the taxpayer are obvious. No complaint can be made of American prices as such, for the American cost of living is far higher than that in Germany, and under such conditions it is to be expected that the American products will cost more. Nevertheless Britain must look after her own interests.

Consider for a moment the German artisan who receives say 40 or 50 marks a week while the cost of such essentials as he can purchase does not exceed perhaps 15 marks. What else is he to do with his surplus money other than to spend it on one of the few available luxuries such as black market cigarettes? He knows that if he has a few cigarettes he might be able to make a deal with a farmer and barter them for potatoes, or if he can save up enough he might even get a little meat. We can blame no one but ourselves for the existence of such a chaotic state of affairs. The more restrictions that are made, the more are industry and progress stifled.

[The views of our correspondents are not necessarily those of THE CHEMICAL AGE.]

A selection of "metal" issues from several sources, discussed in the article on the previous page

American Chemical Notebook

From Our New York Correspondent

"I CANNOT agree that royalties should be charged on patents whose misuse has been so flagrant as to persuade us to approve compulsory licensing of all who desire to use the inventions. Nor do I think that the failure to provide for royalty free licensing may be sustained as an exercise of the judicial discretion of the District Court." This passage forms part of an 18,000-word majority opinion by Justice Harold R. Burton, of the United States Supreme Court, which by a four-to-three decision has ruled that the control of titanium compounds by E.I. Du Pont de Nemours & Co., Inc., constitutes a violation of the Sherman Anti-Trust Act. The Supreme Court has upheld the ruling of the Southern District Court of New York that the companies had combined to restrain foreign and domestic trade in titanium compounds and that the Federal Government was entitled to take action to restore titanium "to a system of free competition." The National Lead Co. and the Titan Co. maintained that the agreements between the companies were only a reasonable exercise of patent rights. The latter company, whose assets are more than $100 million, was described as the largest manufacturer of titanium pigments and compounds in the world. E.I. Du Pont ($1000 million assets) was stated to be one of the largest manufacturers of titanium pigments in the U.S.A.

* * *

A warning that American export trade was heading for drastic shrinkage unless other countries were enabled to earn dollars by greater sales to the U.S.A. was issued by the vice-president of the National Foreign Trade Council, Mr. William S. Swingle, speaking to export managers in Chicago. "Other nations," he said, "must have the opportunity and facilities of obtaining dollars to meet their present and future obligations to the United States. Last year American exports were $15.1 billion while imports were $7.1 billion. This year the figures are expected to be about $18 or $20 billion for exports against $8 or $9 billion for imports. This situation cannot continue indefinitely because the well will run dry. Foreign countries cannot be drained of gold and dollar holdings and still continue to buy from us." Modern industrial advances, he added, and the growing depletion of a significant number of natural resources had underlined American need of raw materials from other countries. He urged that there should be substantial Government "stock piling," especially of such things as lead, copper, zinc, tin, antimony, tungsten, rubber, cobalt, chromium, nickel, vanadium, bauxite and fissionable materials. Financially, the U.S.A. was the major source of capital and credits and its potentialities as an international investor were enormous. "We need many commodities produced abroad, and we ought to be able to get them on the best possible terms and with the lowest possible difficulty. We need foreign markets to maintain high levels of agricultural and industrial activity and employment at home. If the right conditions can be achieved, American direct investments in foreign countries can be substantially expanded with much commercial benefit to the United States and to the countries where our capital is put to productive work."

* * *

The recognition that the need for increased imports cannot be evaded is now fairly widespread, of which there was further evidence at the recent meeting of chemical, drug and allied traders' section of the New York Board of Trade. Mr. Earl J. McClintock, vice-president of Sterling Drug, Inc., urged that there should be both Government and private action to increase imports. He mentioned, in particular, copper and lead and suggested that iron ore and petroleum were possible needs in the future. Discussing the export problems of the American chemical industry, he said that the home chemical industry could successfully meet competition from England, Switzerland and France, but regarded possible revival of German competition as more serious. "The policy of our Government, and that of Britain, too," he said, "seems to be to build up German industry in order to make the British and American zones self-supporting. To get the necessary dollars to pay for food means exports, and a substantial amount of these will be exports of drugs and chemicals as before the war. It should be borne in mind that during the war, whether by the grace of God or by reason of deliberate policy, many of the pharmaceutical and fine chemical plants of the German cartel were not destroyed by bombs—as a matter of fact, many were not even touched. Most of these plants are in the American and British zones. They are working at top speed."

* * *

U.S. Patent No. 2,414,118, which relates to a new process for the production of fluorene and its derivatives has been made available for licensing upon a non-exclusive, royalty-free basis by its owners, the United States Government. The patented process for fluorene production comprises passing vapourised methylbiphenyl at a temperature of about 450° over an asbestos supported palladium-charcoal catalyst. The 4-methylfluorene formed is absorbed on activated alumina and subsequently this is extracted with a solvent. The 4-methylfluorene is recovered by evaporative crystallisation. Two examples showing how the new process may be carried out are given in the patent.

Applications for licensing of the patent, which bears the registry number 5895, should be made to the Solicitor, Department of the Interior, Washington 25, D.C.

* * *

American chemical industry, which has greatly increased its productive capacity and continues to do so, is still unable to supply in full the demands from industry. This is acknowledged in a statement by Mr. L. L. Horch, New York regional director of the U.S. Department of Commerce. The statement was made on the basis of production activity in the chemical industry in June. At the beginning of the second quarter of the year output of inorganic chemicals continued at a high rate, with record production figures for phosphoric acid, ammonia and some other items. Supplies of soda ash, caustic soda, salt cake and other basic items were, however, still short of consumer requirements. Curtailment of manufacture in secondary products continued to restrict operations in some segments of the industry and efforts to import scarce materials from Europe, the Department of Commerce reported, met with little success. Exports of inorganic materials during the first quarter of 1947 were generally much below the quantities shipped out in the first three months of 1946. Despite a continued high level of operations at by-product coke plants, output of cyclic crudes fell short of meeting continued high over-all demand. Buyers of insecticides and fungicides are buying only their immediate wants. Imports of rotenone during the first quarter of 1947 were 200 per cent above those in January-March last year. Pyrethrum remains in good supply, but DDT production is behind demand, notwithstanding a 22 per cent increase in output over last year. Supplies of plastic, the Department indicated, are improving and rapidly approaching a normal supply basis. Trading in crude drugs continues to be confined to materials for immediate requirements, but average wholesale prices for drugs and pharmaceutical materials continued to advance in June for the seventh consecutive month.

* * *

Contracts totalling more than $6 million have been awarded by the Monsanto Chemical Company to W. S. Bellows Co., Houston, Texas, and to the Leonard Construction Company, Chicago, Illinois, for reconstruction of part of the Monsanto installations at Texas City, Texas, which was destroyed in the April 16 disaster. J. P. Mares, who is general manager of Monsanto's Texas division, announced that in addition to the $6 million expenditure a minimum of 1500 men would be employed in the reconstruction work. Installation of chemical process equipment, piping and mechanical work will be undertaken by the Leonard Company. The remainder of Monsanto's plant in Texas City will be rebuilt after the Bellows and Leonard contracts are substantially completed and the plant is again in operation, Mr. Mares announced. The National Board of Fire Underwriters announces that more than 90 per cent of the number of claims arising from the Texas City disaster have now been paid. Only about 400 additional claims remain to be cleared.

* * *

Price reductions in two important groups of industrial chemicals used in a wide variety of products including detergents, antiseptics and cosmetics, and a reduction in the price of polythene, were announced this week by the Du Pont Company. The cuts, on higher fatty alcohols and fatty alcohol sulphates, range from 3 to 12½ per cent and are now operative. The new prices for higher fatty alcohols per lb. are: "Lorol" No. 5 fatty alcohol, 48 cents; *n*-Decanol, 48 cents; and "Stenol" fatty alcohol, 49 cents. The new fatty alcohol sulphate prices per lb. are: "Duponol" C fatty alcohol sulphate, 90 cents; "Duponol" D paste, 30 cents; "Dupenol" G, 72 cents; "Duponol" ME Dry, 87 cents; "Duponol" WA Flakes, 51 cents; "Duponol" WA paste, 25 cents; and Du Pont spinning lubricant L, 25 cents. These prices are for drum quantities in less than car-load lots.

U.S.A. Chemical Output Checked

U.S.A. output of sulphuric acid during April declined 65,790 short tons to 865,447 short tons. This was one of many reductions in production of inorganic chemicals noted by the U.S. Department of Commerce of which other noteworthy examples were soda ash (ammonia-soda process) 15,906 short tons less; electrolytic caustic soda, 11,482 short tons less; and chlorine gas, 8005 short tons less. Of 35 chemicals surveyed 24 showed diminished production. Production of the nitrogenous chemicals declined in varying amounts, ranging up to 10 per cent for synthetic ammonium sulphate. Phosphatic materials fell off generally, with the 16 per cent drop in acid produced from phosphate rock the most significant. Output of calcium and lead arsenate picked up in April, but was considerably below April, 1946.

Canadian Chemical Notes

CANADA, pioneer during the 1914-18 war of the exploitation of magnesium in N. America, is maintaining her leadership in this field. That was admitted by leaders of the magnesium industry of Canada and the U.S.A. recently when, under the auspices of the Magnesium Association, they toured the light metal physical research laboratories of the Resources Department in Ottawa. The visitors watched the world's lightest metal being poured and processed, tested for strains under varying conditions, and viewed extensive new extrusion and rolling machinery not yet in operation. R. D. Taylor, New York, president of the association, said no similar government facilities exist in the United States for research on the metal, "which will eventually take its place among major industrial metals." Research in that country was handled by companies themselves, but none had such an extensive plant as the department's. Canada made the first commercial output from United States raw materials at Shawinigan Falls, Quebec, from 1915 to 1919. The National Research Council led in war research on the product and by the end of 1944 Canada was producing more than 14 tons of magnesium a day, most of which was exported to the United Nations.

* * *

Further evidence that Canada is taking a leading part in the development of atomic power has been given in a C.B.C. broadcast by Dr. C. J. Mackenzie, head of the National Research Council of Canada. The atomic energy pilot plant at Chalk River, Ontario, and its large radio-active pile "capable of producing hundreds of kilowatts of energy" had, he said, "provided the means of gaining much experience and enabled scientists to obtain important and valuable data recorded in hundreds of secret reports and papers." Full-scale chemical separation plants, laboratories for chemical, nuclear and technical physics research as well as medical and biological research have been erected. A complete health division has been set up to protect workers from the hazards associated with radiation and every precaution is taken to eliminate any possible risk to health. More than 400 scientists and engineers are now engaged on research and development there, and there are more than 500 mechanics, electricians and other workers, supplying industrial and auxiliary services. "We can look forward with confidence to taking a leading part in the development of this new field of science which we believe will one day become a great benefactor of mankind," said Dr. Mackenzie.

Turkish Chrome Exports.—Turkey is to export chrome ore to Czechoslovakia.

Dutch Nitrogen Plant

THE systematic but pertinacious industrialisation of Holland, logically enough, has brought about a crop of chemical ventures and projects. Some of these are still under official consideration because much foreign currency will be needed. Among the approved schemes are the plans of the Dutch branch of the Royal Dutch Co., Bataafsche Petroleum, which is able to draw funds from abroad and to invest them here, to set up a nitrogen plant at Ijmuiden at the cost of 30 million guilders, while a plant for plastics as well as for synthetic detergents at Pernis, the site of a big oil refinery, at a cost of 40 million guilders, is also envisaged. The plastics branch is to be ready towards the end of 1948 and will produce polyvinyl types of plastics to the tune of two million kilograms annually.

The Bataafsche has pledged not to poach on the plastics processing industry but to confine itself to supplying the basic material to the latter. But, of course, the export of nitrogen, etc., later on is well contemplated.

Full Recovery

The Bataafsche claims much credit for its large and efficient research laboratory of Amsterdam in evolving novel processes. The pre-war capacity of the MEKOG, a subsidiary of the Royal Dutch, amounted to 16,000 tons of nitrogen. But because of looting and dismantling by the Germans during the war the capacity was much reduced at a time when farmers were clamouring for fertilisers. The MEKOG is about to treble the pre-war production to 51,000 tons a year. Among new plastic processing undertakings, the Internationale Kunststoffen Industrie of Voorschoten may be especially mentioned. Following the arrival of equipment from the U.S. it is working at two shifts to meet the mass of orders.

The Dutch Yeast and Spirit Co. (Nederlandsche Gist-en Spiritusfabriek) has set up a plant to produce penicillin. Much of the home demand for this product will be covered by it.

Holland lacks the benefit of a soda ash industry of its own, with the exception of the small conversion of carbon dioxide along with the reduction of the natural salt from the Boekelo mines by the State Coal Mines. The latter now intends to erect a large soda ash plant. It is also to make aniline and benzidine from its nitrobenzene.

Advices from Santiago say that Chilean copper production in 1947 is not expected to exceed last year's total of 370,000 tons, although 470,000 tons were produced in 1945. Chile's maximum plant capacity is estimated at about 500,000 tons. The United States and Great Britain continue to be the chief purchasers.

Model Calorimeter Room

Good Laboratory Principles in Liverpool Gas Plant

THE need for scientific accuracy in some departments of a large gas undertaking is no less than in other forms of laboratory. The importance of exact determination of the calorific value of gas output is illustrated at the Liverpool Gas Company's Garston works which supplies more than a third of the total consumption of 10,000 million cu. ft. a year and is planned to provide in the near future 7,500 million cu. ft. Dealing with deliveries on this scale, accurate readings of calorific values are obviously essential. A rise in the C.V. of delivery gas of, for example, from 450 to 451 would represent a loss on a quarter's working of some 10,000 therms.

Adaptable Lay-out

With this in mind, the new Fairweather calorimeter room at Garston is spacious and liberally serviced and is designed to reproduce laboratory accuracy. Even more important, perhaps, in the laboratory designer's view is the foresight exhibited in the lay-out and materials of the fairly elaborate equipment. It is an excellent example of designing for future, as well as for present requirements, and for solid endurance.

Essential Instruments

Beneath each of the instruments the corresponding gas flow recorder will be installed. On one of the benches is a gas specific gravity recorder, which can be switched in to any gas and among other instruments accommodated in the convenient bench lay-out are a modern G.L.C. pattern Bone and Wheeler gas analysis apparatus (for determining the organic sulphur in gas, gas samples and similar equipment for examining purified gases.

The "nerve centre" of the calorimeter room is the 5 ft. gas switching panel, with its six rows of plug-in gas sockets, each row of eight sockets, sufficient for general requirements, present flow and the four coal gas streams with which this room will later have to deal. All gas supplies are carried from the appropriate main in the meter house through ¾ in. tin pipe without unions to ensure that the gas contains the same H_2S content as the gas in the main.

The calorimeter room, showing practical, spacious lay-out

Vinyl Resins Gaining Ground in the U.S.A.

NEW peace-time markets for paints and other coatings have grown to such dimensions that at present there is room for both the natural gums or resins and the newer synthetics. Natural fossil gums and shellac are now available in increasing amounts in the U.S.A., but imports are still much below requirements, and this and the steep price rises are prejudicial to any serious competition with the synthetics. It is complained that the Dutch Government is fixing prices of copal and similar products at levels which discourage full production, and output and transport are adversely affected by political troubles in the East Indies.

U.S. imports of gums and shellac—the U.S. *Chemical and Engineering News* records—ranged between 62.5 mill. lb. in 1930 and 104.1 mill. lb. in 1940. During the war, record manufacturers used very thin coatings of shellac, or did without and used vinyl resins. The latter lately have been lower priced than the natural products. According to latest U.S. reports basic shellac, grade TN was 62-65 cents per lb., and other qualities up to 74 c. Some grades of vinyl resins are quoted as low as 34 cents in quantities of 200-10,000 lbs., while other descriptions are 40-46 cents. Shellac is now probably three times the pre-war price level, and the high cost of industrial alcohol solvent does not encourage any reduction.

Some American buyers are said to be turning to synthetic substitutes, which probably means vinyl rather than the substitute shellacs used during the war.

Vinyl resins are being used in the U.S.A. for records. Manufacturers are also experimenting with ethyl cellulose and other plastics. Phthalic alkyds probably offer the most serious competition to other imported varnish gums, although no synthetics can properly replace gums of the dammar type. Alkyds are at present in strong demand. Modified ester gums or resin esters are considered satisfactory replacements for a number of foreign varnish gums, according to their use.

The challenge from synthetics is not being ignored in India, and much work is being done at the Indian Lac Research Institute to improve coatings prepared from the natural product. In new types of varnish evolved by the institute, lac is dissolved in linseed oil, yielding very good varnishes having high gloss, weather resistance, and other properties. Lac can be made to dissolve readily in linseed oil if 15 per cent red lead has been previously boiled with the oil.

INSTITUTION OF CHEMICAL ENGINEERS

List of New Members

DURING the three month period April-June the following have been elected to the Institution of Chemical Engineers:

Members.—I. T. Griffiths, B.Sc., British Aluminium Co., Ltd. (transfer); N. C. B. Hay, B.Sc., A.R.C.S., North British Rayon, Ltd. (transfer); G. Ogden, M.Sc., Hardman & Holden, Ltd. (transfer); R. S. Rutck, British Isinglass Co., Ltd., (transfer); K. B. Ross, B.A., B.Sc., Anglo-Iranian Oil Co., Ltd., (transfer); H. Smith, M.Sc., A.R.C.S., D.I.C., I.C.I. Ltd. (Dyestuffs Division) (transfer); A. E. Taylor, M.Sc., Simon-Carves, Ltd.

Associate Members.—P. A. Branch, B.Sc., British Industrial Solvents, Ltd. (transfer); A. Cooper, B.Sc., Bedaux Co. for Africa (transfer); G. H. L. Flach, B.Sc., A.C.G.I., Monsanto Chemicals, Ltd. (transfer); W. A. Hayward, M.Sc., Ph.D., A.R.I.C., Monsanto Chemicals, Ltd. (transfer); W. Lowenstein, B.Sc., Most, Czechoslovakia (transfer); E. A. K. Patrick, B.Sc., A.R.I.C., Gas Light and Coke Co. (transfer); J. A. Stahelin, B.Sc., A.C.G.I., I.C.I. Ltd. (Dyestuffs Division) (transfer).

Graduates.—A. J. U. Bull, B.Sc., A.R.I.C., East African Industrial Management Board; P. Dalley, A.R.I.C., Battersea Polytechnic; D. M. Drake, late of the Shanghai Gas Co. (transfer); J. A. Hornby, A.R.I.C., I.C.I. Ltd., Runcorn; J. R. Maunsell, B.Sc., A.C.G.I., Erith Oil Works (transfer); W. McLeod, B.Sc., A.R.I.C., Bakelite, Ltd., L. N. Preston, B.Sc., A.R.I.C., The Fullers' Earth Union, Ltd.; J. F. Richardson, B.Sc., A.C.G.I., Imperial College of Science and Technology (transfer); D. R. Scarffe, M.Sc., A.R.C.S., A.R.I.C., Distillers' Co., Ltd.; F. P. Stainthorp, B.Sc.(Tech.), A. Boake, Roberts & Co., Ltd. (transfer); A. J. Walkley, B.Sc., A.R.C.S., A.R.I.C., J. M. Collett & Co., Ltd.; H. Winning, Jnr., B.Sc., Albright & Wilson, Ltd.

Students.—W. F. Aitken, Sir John Cass Technical Institute; W. H. Caswell, Millfield, Street; R. H. Clark, K. A. F. Edwards, R. A. Furlong, M.A., A. Holden, J. Kubanek, E. Limfat, G. J. O'Connell, and A. W. Pratt, all of Imperial College of Science and Technology; D. C. Freshwater, B.Sc., Alan Hedley Norris, B.Sc., A.R.I.C., and J. W. Pease, all of Loughborough College; E. G. E. Land, B.Sc., Battersea Polytechnic; E. Massey, B.Sc., Kodak, Ltd.; S. J. Waterman, B.Sc., A.R.I.C., South-West Essex Technical College.

INFRA-RED HEATING BY GAS

A fully representative display of the many well designed appliances produced by or for the gas industry for industrial uses of infra red heating by gas was presented recently by the British Gas Council at Gas Industry House, Grosvenor Place, London, S.W.1. The exhibition stressed chiefly the many applications of infra-red heat to the curing of paint and similar finishes of small articles, in which the method, in conjunction with specially designed conveyors, has effected great time saving. Although this is the field of greatest usefulness at the moment, the exhibition also provided evidence that further extension of the principle to other operations, such as the application of plastics to textiles and the pretreatment of ceramics, will be profitable.

PARLIAMENTARY TOPICS

Shortage of Bismuth.—Mr. J. Lewis asked if the President of the Board of Trade was aware of the shortage of alkaline powder required for medicinal purposes; and if he would make a statement on the shortage of bismuth metal, which is an essential ingredient.—Mr. J. Belcher: I am aware of a shortage of alkaline powder due to the shortage of bismuth metal, but I can assure my hon. friend that every effort is being made to obtain increased supplies of this metal.

Furnace Blacks. — Mrs. L. Middleton asked the President of the Board of Trade what plans are being made in this country, or are contemplated, for producing furnace blacks of equal quality to channel blacks by the Statex K method.—Sir Stafford Cripps: I am not aware of any plans for making carbon black in this country by the Statex K method, or that it has yet been proved whether this method produces blacks of equal quality to channel blacks. Trial parcels are now being imported so that its qualities may be tested.

Private Imports.—Replying to Mr. E. H. Keeling, Mr. J. Belcher (Parliamentary Secretary, Board of Trade) gave a list of raw materials, the importation of which has been transferred from the Board to private account, which included the following: Mercury, arsenic and most miscellaneous chemicals, carbon black, plastic raw materials, shellac, beeswax and damar gum. Ultimate control of such purchases was still retained by the Government by the import licensing procedure.

Science Graduates.—The basis of allocation of science graduates and research scientists to Government departments, industry, industrial research and teaching was the subject of a question to the Minister of Labour by Mr. K. Lindsay.—Mr. G. Isaacs: It is the responsibility of my department, acting on the advice of the Technical Personnel Committee, to allocate these young men according to the needs of the Armed Forces and essential civilian employment, including research and teaching at universities and similar institutions. These young men are not permitted to take up school-teaching posts instead of being called up.

Malayan Tin.—I am aware that the time taken to deliver equipment from this country is delaying the rehabilitation of the tin mining industry in Malaya. All possible measures are being taken to expedite delivery.—Mr. Creech Jones.

$23 Million for Tin.—Since the end of Lease-Lend, exports of tin from Great Britain and the tin-producing Empire countries have earned $23 million (to the end of June). No useful estimate of future earnings can be made.—The Chancellor of the Exchequer.

Dead Sea Chemicals.—Continuing the "Parliamentary quantitative analysis of the constituents of the Dead Sea," which had been the subject of questions at a previous session, Mr. R. Stokes asked the Secretary of State for the Colonies what was the quantity and value of sodium chloride estimated to be contained in the Dead Sea, according to Palestine Government survey (by the late Mr. G. S. Blake) in 1923.—Mr. Creech Jones: 11,900 million metric tons. It is impossible to put a value upon Dead Sea common salt as, owing to the heavy freight charges, it cannot compete with salt from other sources.

More Soda Ash.—I hope that as from mid-July it will be possible to increase supplies of soda ash to woolcombers to the total of requirements as recently notified by them to the Wool Control.—Mr. J. Belcher.

Manpower.—The estimated distribution of total manpower at the end of April, 1947, among industries shown in the Economic Survey included: Chemicals, 327,000; metals and engineering, 2,817,000; coal industry 750,000.—Mr. G. Isaacs.

Stockholm Measurement Congress

FIVE hundred experts on weight and measurement problems met recently in Stockholm where they held a four-day congress. The meeting, which was arranged by the Swedish Academy for Engineering Research and the Swedish Association of Technical Physicists, was attended by representatives of fourteen countries; the programme included some 50 lectures and discussions. As an adjunct to the congress, an exhibition was arranged in the Royal Tennis Hall, where 63 exhibitors representing 221 manufacturers from eleven countries demonstrated the latest advances in the field of measuring instruments. An infra-red spectro-photometer of British design, which is to aid the chemical industry in determining the ingredients of sample products, attracted special interest.

Russia Seeking Persian Oil.—Persia may lease to the Soviet Government oil rights on the same basis as the rights which Britain and the U.S.A. now enjoy. A request for concessions has been received from Russia, according to a recent statement in America by the chief of the Persian air corps.

Technical Publications

The 1947 edition of "Light's Organic Chemicals" is now available, providing a useful guide and price list of a great variety of organic chemicals and natural and synthetic drugs available from L. Light & Co., Ltd., Wraysbury, Middlesex.

* * *

Makers of specialised brushes for a variety of industrial purposes, as well as the familiar domestic article, the Kleen-E-Zee Brush Co., Ltd., recalls in "Brushmaking Through the Ages" that its industrial division during the war provided over 19 million brushes of one kind or another for war undertakings.

* * *

Of permanent value as a work of reference is the 46 pp. booklet from Bradley and Foster, Ltd., of Darlaston, Staffs, providing much essential information on acid-resisting silicon irons, which supplies in a convenient form many of the results of the research carried out during the war at the Ministry of Supply silicon iron factory at Darlaston, supplemented by much independent information.

* * *

An essential service to all who use corrosive fluids is provided by Hathernware, Ltd., whose wide range of chemical stoneware of specially prepared dense ceramic, heavily vitrified, is proof against almost every fluid, no matter how destructive—with the exception of hydrofluoric acid, which attacks all silicates. The convenient design and varying capacities of these vessels are illustrated in a current Hathernware booklet.

* * *

The prospect of widened supplies of vegetable oils from Empire sources is suggested by a series of studies of specific investigations published in the current issue (Vol. xliv, No. 4) of the *Bulletin of the Imperial Institute.* Also surveyed in this number are Scottish mica deposits, tantalum, sillimanite and kyanite of Australia, production of minerals and meals in Cyprus and mineral resources of Nigeria and Tanganyika.

* * *

Intended as a guide to the planning and interpretation of experiments on the industrial scale, "Industrial Experimentation," issued this week by the directorate Royal Ordnance Factories (Explosives) (H.M.S.O., 2s. 6d. net), provides accounts of tests of significance written from the point of view of those who have to apply them in practice. It deals with pilot plant and plant-scale experiments on chemical manufacturing processes in the Royal Ordnance Factories.

A new range of combustion tubes with exceptional heat and chemical resistance is announced in the leaflet "Mullite Combustion Tubes" produced by the Thermal Syndicate, Ltd. This new ware (No. 525) consists chiefly of Mullite crystals bonded by interstitial glass to produce a material thermally conductive and resistant to thermal shock, very suitable for use in electric furnaces at temperatures above the limit of Vitreosil (1050° C.) and below the 1800° C. possible with the firm's super refractories.

* * *

Latest data concerning a large range of the products of Murex, Ltd., are contained in a new list of technical folders now being issued. Latest publications include standard specifications and typical analyses of salts, oxides and acids of molybdenum, tungsten and vanadium; detailed, illustrated studies of "Fel" brand nickel, hardened anti-friction metal and of cast iron incorporating molybdenum, and informative pamphlets on various hard metal powders and on the wide and versatile productive capacity of the Murex plant at Rainham.

* * *

The fuel research organisation of the Department of Scientific and Industrial Research has just issued Fuel Research Technical Paper No. 49—"The Characteristics of Pulverised Coal—Effect of Type of Mill and Kind of Coal." (H.M. Stationery Office 1s. 8d., by post 1s. 5d. The review—a summary of which was made available to the Harrogate conference of the Institute of Fuel—provides a very detailed examination of the characteristics, constituents and behaviour of five representative British coals ground in six differing pulverising mills.

* * *

Some of the reasons why stoneware is the chosen material for so many chemical processes are reviewed in the latest trade publication (Section No. 6) of Doulton and Co., Ltd. In addition to the more obvious qualities, such as its virtually complete immunity to corrosion, Doulton ware is distinguished by a number of special qualities. The body of the ware, for example, is acid-resistant throughout, so that chipped glaze is not serious; new processes of manufacturing vessels with low porosity and high abrasion resistance and heat and thermal shock resistance are being produced to fulfill a great variety of special requirements. Because of its plasticity, stoneware can be produced to fulfill almost any need in respect to shape and capacity.

WORLD FERTILISER PRODUCTION

THE International Emergency Food Council in Washington has made the following allocations of fertilisers (tonnage based on nitrogen content): Britain, 184,795 tons; Canada, 24,000; U.S., 741,493; Norway, 19,500; Chile, 9,600; Belgium, 89,000; France and Empire, 239,290; Holland, 94,650.

Spain

According to *Ion*, 1947, *7*, 181-4, there are brighter prospects for increasing supplies of fertilisers this year, after the serious deficits of previous years. The 1946 allocation from the Combined Food Board in Washington was only 155,000 tons instead of the 465,000 tons requested. Fortunately, the cereal harvests and the yield of olives last year were very good despite fertiliser shortage. Increasing attention is now being directed to the cultivation of rice, under the Dirección General de Agricultura. This crop will have had the benefit of the entire supplies of the home-produced ammonium sulphate (16,000 tons), together with 20,000 tons received from Belgium.

As was anticipated, some of last year's fertilisers were much better than others. Among the more marked deficits must be noted calcium phosphate, of which only 80,000 tons were received in 1946 as compared with 254,000 in 1945, and superphosphate, for which the figures must be doubled. On the other hand, Chilian nitrate was relatively plentiful, 90,000 tons being imported in 1946 out of a total agreed of 112,500 tons, and a still larger quantity is expected this year. For some years prior to 1946 very little nitrate of lime had been available, but in that year 20,000 tons were obtained from Norway; it was used mainly for the wheat, beet, and sugar cane crops.

Of a 1946 total of 12,273 tons of ammonium nitrate, the greater part came from England with a small consignment from Sweden. Although practically no cyanamide or dried blood was imported last year, the recent agreement with the Argentine presupposes that appreciable quantities of the latter will be imported in 1947.

Scotland

Fertiliser manufacturers in Scotland are looking ahead to shortage conditions likely to develop later in the year and are doing their best to augment supplies. They are finding this extremely difficult because of the very limited deliveries of certain chemicals which prevent continuous production. Shortages of sulphate of ammonia, nitro-chalk and nitrate of soda outweigh the improvement in the supply of some other chemicals. Demand from growers is now, of course, very limited, but manufacturers anticipate that later consumers will make their usual seasonal rush and attempt to compress activity into a too limited period. Against this, the system of rebate on early delivery may assist in encouraging growers to take delivery earlier.

Chile

Market reports from Chile indicate that production continues to be optimistic, and prospects have not been so favourable for many years. Although foreign demand appears to be assured for some time, output depends upon the co-operation of labour. The production figure for 1946 was greater than that of any year since 1930, but it seems unlikely that the present rate can be increased to any great extent in the near future. The long-term view, however, must take into account the installation of new plant and machinery. In this respect, Swedish interests are reported to be willing to help, apparently with a view to expanding exports of nitrate to Sweden. China is said to have been negotiating for the purchase of 500,000 tons of Chilean nitrate for delivery over a five-year period.

India

On account of representations made by the Bone Crushing Industry, the Government of India are allowing exports of 40,000 tons of crushed bones. The committee of the Indian Chemical Manufacturers' Association have taken strong objection to the policy of the Government of India in allowing the export of bones, which has resulted in a rapid increase in the price of bones in India. The committee feels that in the interest of the superphosphate and glue industries and the economy of the country, the export of bones is harmful. They have also urged that the Government of India should not allow any imports of superphosphate, so long as the Indian industry is in a position to increase output.

U.S.A.

There will be increased production of nitrogen, phosphates and potash during 1947-48 season, the American Plant Food Council, a trade organisation, reports. U.S. fertiliser manufacturers have already more than doubled their pre-war production by expansion of facilities. The Council estimates that next year nitrogen fertiliser will be approximately 10 per cent in excess of the amount used in 1946-47, superphosphate production will be 10 per cent higher; triple superphosphate, 25 per cent higher, and potash will be slightly greater.

Overseas News Items

Blue Asbestos Mining in Australia.—The mining of blue asbestos is reported to have been started in north-west Australia.

Penicillin Plant for Mecklenburg.—A penicillin plant to be established in Rostock, Mecklenburg, will commence production at the beginning of October.

No German Whaling Expedition. — A German request for the resumption of whaling has been refused by the U.S./British occupation authorities.

Belgium Steel Output.—Dependent upon promised improved fuel supplies, Belgium steel producers hope to raise their output to 250,000 tons for July.

Argentine Linseed Crop Forecast.—According to the third official estimate, the Argentine linseed crop should total 1,050,000 tons, nearly 100,000 tons more than last year's crop.

Russia Wants U.S. Oil Equipment.—Dresser Industries, Inc., is reported to have received a million-dollar order from Soviet Russia for oil drilling machinery, pumps and a liquid methane plant.

Leipzig Fair.—The Leipzig Autumn Trade Fair will be held this year from September 3 to 7. Applications to visit the fair should be made to the Board of Trade, German Division, I.C. House, Millbank, London, S.W.1.

Egypt to Have Ammonium Nitrate Plant.—The Egyptian cabinet has decided to set up a factory for the manufacture of ammonium nitrate fertiliser at Aswan, instead of a nitrate of lime plant at Nag Hamadi.

Dutch Palm Oil Plants for West Africa.—The Stork Engineering Works, Amsterdam, is reported to have received an order for the construction of ten palm oil plants in West Africa, delivery to be completed within three years.

New Chicago Fatty Acids Plant.—The manufacture of fatty acids and their derivatives is to be undertaken by Armour and Co. in a new plant to be erected in Chicago at an estimated cost of several million dollars.

German Pharmaceutical Exports.—It is reported that the authorities in Minden are busy examining German export programmes amounting to about 185 million Rm., for which imports valued at 5.5 million Rm. will be required. The pharmaceutical industry, which is planned to play an important rôle in Germany's future exports, will achieve 80 per cent of the pre-war figure by 1949.

Hungary's Oil Production.—Hungary produced 684,700 tons of crude oil and over 91 million cu. m. of natural gas in 1946.

Radioactive Minerals in British Guiana.—A Bill has been drafted in British Guiana to control prospecting and mining of radioactive minerals.

Indian Shellac Exports.—India's shellac exports amounted to 89,450 packages last month, compared with 84,449 and 5[illegible],471 in the two previous months.

Barytes Deposit Discovered in France.—A barytes deposit, with a metal content of 96 per cent, has recently been discovered in the Lourdes area of France.

South African Coal for Oil.—South Africa is stated to be negotiating exchange arrangements under which the Dominion would send coal to the Argentine in exchange for 250,000 tons of Argentine vegetable oil.

U.S. Oil Shale Plant.—Oil is being produced from Colorado oil shale at a demonstration plant started recently at the U.S. naval oil reserve near Rifle, Colorado. The scheme has the support of the U.S. Bureau of Mines.

U.S. Aluminium Shelter. — U.S. Army engineers have designed a prefabricated aluminium shelter capable of withstanding 125-m.p.h. winds and an outside temperature of 70° below zero, at the same time keeping occupants warm and comfortable.

Persian Exchange Regulations.—The Persian Exchange Control regulations are under review. For the time being, however, official rate sterling can be obtained only for the import of a limited number of goods which includes drugs, dyestuffs, industrial chemicals, and chemical fertilisers.

U.S. Phthalic Anhydride.—According to a spokesman of the Allied Chemical and Dye Corporation, annual production of phthalic anhydride is to be increased to 200 million lb., as compared with the present level of about 167 million lb. The 1940 figure was only 60 million lb.

Chile an Oil Producer.—Less than 18 months after the first successful oil strike in Chile, a local well is producing at a daily rate of 1000 barrels, and the Minister of Finance has said that "in the near future Chile will succeed in producing all the petroleum it needs." It is reported that the Government is negotiating in the United States for the purchase of a complete refinery, capable of treating some 8000 barrels daily. Domestic and imported crude oil is to be used.

Personal

Mr. James Brown, one of the first directors of Allied Ironfounders, has retired from the board.

Lt.-Col. E. Vigor has been appointed to the board of Neuchatel Asphalte in succession to **Mr. R. A. Daniell**, who has resigned.

Mr. M. B. Donald, a joint hon. secretary of the Institution of Chemical Engineers has been appointed a director of the Bureau of Abstracts.

Prof. Linus Pauling, professor of chemistry in the California Institute of Technology, is to be George Eastman visiting professor at Oxford University for the 1948 Hilary and Trinity terms.

Mr. Percy Chadwick, who recently retired after 50 years with a Manchester firm of manufacturing chemists, has been appointed chairman of Manchester and Salford Hospital Saturday Fund.

Mr. P. D. O. Liddell, who left England on the *Oranje* on June 28, is now on his way to Singapore to take up an appointment as technical representative of the Dunlop Rubber Co. (S.S.), Ltd.

Mr. L. H. Bartlett has been appointed a director of Central Provinces Manganese Ore to fill the vacancy caused by the resignation (on grounds of ill-health) of **Sir A. R. Nelson**.

Sir Frederick Leggett, C.B., has been appointed chairman of the London and South Eastern Regional Board for Industry. He has had a long association with industrial relations and was Chief Adviser on industrial relations to the Ministry of Labour and later Chief Industrial Commissioner.

Sir William Coates, deputy director of I.C.I., and **Sir Graham Cunningham**, chairman and managing director of Triplex Safety Glass Co., have been nominated by the Federation of British Industries and the British Employers' Confederation to be members of the Economic Planning Board.

Mr. R. H. S. Robertson, who has done a considerable amount of work as a member of the Scottish Reconstruction Committee in attempting to interest industry in the utilisation of raw materials in Scotland and especially in peat and bracken, has now resumed business as an independent consultant on raw material development.

Mr. A. H. Kemp, of Aberdeen, was presented with a radio set and a travelling bag by members of the staff of Messrs. John Miller and Co., Sandilands Chemical Works, Aberdeen, on his retirement from the position of manager. Mr. Kemp entered the firm in 1893 and has been manager for several years.

The Aluminium Development Association announce the following staff changes: **Mr. W. J. McLaughlin** has been appointed secretary of the Association in place of Mr. Daves who has resigned; **Mr. J. D. Beddows**, B.Sc., who has been employed by the association as chief metallurgist since June 1944, has resigned to take up an industrial position in the Midlands; **Mr. J. C. Bailey**, B.Sc., who has been on the staff of the association since 1946 has been appointed technical officer to take over most of the duties previously carried out by Mr. Beddows; **Mr. P. G. Studholme**, B.A., has been appointed to the editorial department of the association.

Obituary

Dr. F. C. Whitmore, well-known chemist and dean of the School of Chemistry and Physics at the Pennsylvania State College, died last month in State College City at the age of 59. He was recognised as a world authority on organic compounds of mercury, a subject upon which he wrote extensively.

U.S.A. Curtails Research

The U.S. Bureau of Mines is to close four large and eight small pilot plants, to abandon or sharply curtail exploration and research on fissionable and other strategic minerals, and to discontinue numerous services to industry and the public, as a result of budget reductions. Major plants scheduled for closing on July 1, 1947, are the electrolytic manganese pilot plant at Boulder City, Nevada, the bauxite beneficiation mill at Bauxite, Ark.; the rotary kiln sponge iron pilot plant and laboratory at Laramile, Wyn., and the lignite gasification pilot plant at Grand Forks, N. Dak. Smaller pilot plants to be abandoned are the tunnel kiln sponge iron and tungsten metallurgy plants at Raleigh, N.C.; zinc dithionate, vanadium and antimony plants at Salt Lake City, Utah; electrothermic magnesium plant at Pullman, Wash.; pyrometallurgy plant at Boulder City, Nev.; and alumina plant at Rolla, Mo. In addition, construction will be halted on a zirconium plant at Albany, Ore.; studies will be abandoned on iron-ore beneficiation at Tuscaloosa, Ala., and on steel at Raleigh, N.C.; and metallurgical research will be drastically curtailed—50 per cent in most instances—in remaining plants.

Argentina to Make Penicillin.—An 11-million dollar penicillin plant is to be built in Argentina by E. R. Squibb and Sons (Argentina), Ltd. In order to prevent competition the Argentine Government, it is understood, has agreed to the firm's request to limit imports of penicillin during the initial production period.

Home News Items

Society of Dyers and Colourists.—Under the auspices of the Society of Dyers and Colourists, a symposium on recent advances in the theory and practice of dyeing is to be held at Blackpool from September 25-27.

Chemical Engineering Symbols. — The council of the Institution of Chemical Engineers has agreed to adopt the American Standard Letter Symbols for Chemical Engineers (A.S.A. Z10.12-1946) for publications of the Institution.

Chemical Society's Library.—The library of the Chemical Society will be closed for stocktaking from Monday, August 4, until Saturday, August 16, inclusive, and will close each evening at 5 o'clock from July 24 to September 30.

Scottish Steel Plans.—The Minister of Supply (Mr. J. Wilmot) has assured a Scottish labour deputation that no time will be lost in reaching agreement on a scheme for the development and modernisation of the Scottish iron and steel industry. New proposals for development and expansion are being prepared by the firms concerned.

More Mechanised Mining.—More than a thousand mechanical coal cutters have been manufactured in Britain and sent to the collieries this year. In addition 2500 manual cutters have gone to the pits. The National Coal Board hope that half the pits in Britain will be mechanised by the middle of next year.

New Zinc Specifications.—The British Standards Institution has re-issued in modified form the British Standard Specifications for zinc, incorporating B.S. 220—Fine Zinc (Grades A and B), B.S. 221—Special Zinc, and B.S. 222—Foundry Zinc. The specifications cover the chemical composition of all grades of zinc and the method of sampling for analysis. A slight modification of the chemical composition of Grade A (fuel zinc) has been made and the use of the word "spelter" has been discontinued.

Petrol in Sewer.—For permitting petrol to enter a sewer, Messrs. Hugh R. Leonard and Julian M. Leonard, trading as Carless, Capel and Leonard, petrol and naphtha distillers, Hope Chemical Works, Hackney Wick, London, E., were fined £5 with two guineas costs on each of two summonses. Counsel for the defendants said that the firm, which was the pioneer of petrol refining in this country, used three interceptor tanks to remove water. The plant may have been overdriven and the raw material now being delivered sometimes contained water in the form of a stable emulsion.

Change of Address.—Croda Ltd., lanolin specialists and chemical manufacturers with headquarters at Goole, Yorkshire, have recently transferred their London office to 24 Haymarket, S.W.1.

Five-day Week.—Agreement has been reached for a five-day week for all engaged in the Cleveland ironstone mining industry. The new hours will come into operation on July 21. Surface workers will work 44 hours and underground workers 40 hours.

Chemical Engineering Abstracts. — The council of the Institution of Chemical Engineers has entered into an agreement with the Bureau of Abstracts by which the former will contribute to the latter over a five-year period an increasing number of improved chemical engineering abstracts.

Ban on Lead Glaze.—To safeguard the health of workers in factories making glazed pottery, the use of glazes containing lead and the use of ground or powdered flint or quartz is to be prohibited. These are among the clauses of new regulations with which it is proposed to replace the Pottery (Health) Special Regulations.

Henderson Memorial Laboratory.—The formal opening of the G. G. Henderson Memorial Laboratory in the Chemistry Buildings, at Glasgow University, took place last week. The laboratory, a fitting memorial to the late Professor Henderson's 18 years in the Chair of Chemistry and his 27 years' service to the Royal Technical College, will be used for organic chemistry.

Scottish Peat.—The Scottish Reconstruction Committee at a special conference held in Glasgow recently, approved a resolution calling on the Government to initiate a programme of full utilisation of Scottish peat resources. The conference was attended by representatives of industrial, scientific and commercial interests concerned with peat and discussed fully the establishment in Scotland of a group of industries based on peat.

Staggered Hours.—To spread the load at their Speke works, the Dunlop Rubber Co. has for some time been working a substantial night shift on certain heavy plant, such as rubber-mixing machines, with the result that a big proportion of the load has been taken off the day shift. "Our object has been to transfer the load rather than people," said an official of the firm. The "staggering" principle has been fairly widely adopted in the Merseyside engineering industry with good results, one firm having reduced electricity consumption by one-third.

Company News

The nominal capital of **Potter and Clarke Ltd.**, 60-64 Artillery Lane, E.1., has been increased beyond the registered capital of £180,000, by £20,000, in £1 6 per cent cumulative preference shares.

The British Drug Houses, Ltd., announces a net profit for the year ended December 31, 1946, of £91,637 as compared with £47,828 in 1945. A dividend of 8 per cent is recommended on the company's ordinary shares.

Fullers Earth Union is raising the bonus on its ordinary shares from 2½ per cent to 5 per cent, making a total payment of 20 per cent. The company's net profit for the year is £37,061 compared with last year's figure of £22,706.

Richard Thomas and Baldwins announces a final dividend of 10 per cent on its ordinary shares making a total of 15 per cent for the year ended March 29, 1947. (The total distribution for each of the preceding three years was 12½ per cent.

Reckitt and Colman, Ltd., announces a trading profit for 1946 of £2,902,319 as compared with the 1945 figures of £2,716,288. A final dividend of 5 per cent has been proposed, making a total of 20 per cent for the year.

William Fulton and Sons, bleachers, dyers, etc., proposes to increase its borrowing powers from £50,000 to £100,000 to cover the costs of capital replacements and complete renovation to this effect is to be placed before the shareholders on July 23.

Neuchatel Asphalte has declared a dividend of 2½ per cent on the ordinary shares, compared with 2 per cent for each of the four preceding years. Net profit is given at £35,055 as against last year's figure of £22,576.

New Companies Registered

M. & C. Chemists, Ltd. (N.I.2320).—Private company. Capital £10,000 in £1 shares. Directors: G. A. Campbell and D. Moore. Registered office: Bank Chambers, Hill Street, Newry.

A. C. Beeson and Sons, Ltd. (437,161).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers in paints, varnish, lacquer, etc. Directors: C. Beeson, and Geo. Beeson. Registered office: Hutton Road, Fish Docks, Grimsby.

Sandoz Products (Ireland), Ltd. (11,931).—Private company. Capital £10,000 in £1 shares. Manufacturers of and dealers in colours, dyestuffs and chemical products, etc. Subscribers: C. R. Arlotte, 10a De Vesci Terrace, Dun-Laoghaire, Co. Dublin, and Edith Campbell.

John Hamilton & Co. (Pharmaceuticals), Ltd. (25,427).—Private company. Capital £15,000 in £1 shares. Chemical manufacturers, etc. Directors: J. Whitehead Hamilton and G. Smith. Registered office: 16 Watson Crescent, Glasgow Cross, Glasgow, C.1.

Cosmos Chemicals, Ltd. (438,015).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, lacquers, paints, etc. Subscribers: S. S. Fisher and S. W. Cheverton. Secretary: S. S. Fisher. Registered office: 9 Mansfield Street, W.1.

Westnor Products, Ltd. (437,867).—Private company. Capital £1000 in £1 shares. Patent fuel manufacturers, manufacturers of and dealers in chemicals, solvents, acids, alkalis, drugs, etc. Directors: H. Macartney, H. Hibbert and J. Fletcher. Registered office: 44 Brazennose Street, Manchester, 2.

William Harper (Merchants), Ltd. (437,269).—Private company. Capital £2500 in £1 shares. Manufacturers and factors of and dealers in paints, colours, varnishes, lacquers, cellulose products and solvents, etc. Directors: W. Harper and Elizabeth Harper. Registered office: 60 Overlinks Drive, Salford.

Harold Industries, Ltd. (438,118).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in paint, adhesives, polishes, chemical preparations, stains, food powders, etc. Subscribers: H. V. T. Baker and A. Moon. H. V. T. Baker is the first director. Registered office: 2 Finchley Way, N.3.

Next Week's Events

TUESDAY, JULY 15 and WEDNESDAY, JULY 16

The Chemical Society. The Central Hall, Westminster. Centenary celebrations: Reception, 9.45 a.m.; Centenary Address (by Prof. C. N. Hinshelwood, president), 3.30 p.m. Wednesday: 3 p.m. Sir Robert Robinson: "The Development of Electrochemical Theories of the Course of Reactions of Carbon Compounds" (Faraday Lecture).

THURSDAY, JULY 17—24

Society of Chemical Industry. The Imperial College, South Kensington. 11th International Congress of Pure and Applied Chemistry.

FRIDAY, JULY 18 and SATURDAY, JULY 19

Institute of Physics. (Industrial Radiology Group). 2 Savoy Hill, London, W.C.2. A symposium on "Methods of Crack Detection."

World Tin Allocations

Over 50 p.c. for the U.S.A.

THE Ministry of Supply announces the following interim allocation of tin metal (in tons) by the Combined Tin Committee for the second half of 1947:—

Australia 103, Austria 22, Canada 300, Ceylon 8, Chile 29, Czechoslovakia 161, Denmark 119, Egypt 76, Finland 35, France 1515, India 525, Ireland 7, Italy 657, New Zealand 42, Norway 90, Palestine 16, Philippines 4, Poland 239, Sweden 293, Switzerland 225, Turkey 90, U.S.A. 6750, Uruguay 25; total 11,331 long tons.

The quantity of tin metal which will become available for allocation during the second half of this year is expected to be considerably greater than the total now being distributed, and further allocations will be announced on or about August 20. The present interim allocations are intended to ensure that there shall be no interruption in the movement of supplies from producing areas, pending receipt by the Committee of complete reports from consuming countries on past consumption and future requirements.

The present allocations were determined on approximately the same basis as those announced by the Committee on March 18. They represent, however, the allowances due to each country after deduction of amounts over-purchased against previous allocations. The latter in some countries exceed the new interim allocations. Such countries may expect to receive allocations later in the year.

Supplies may be obtained from the following sources: The U.K. on behalf of Malaya and Hong Kong, the Netherlands, Belgium, China, Siam and the U.S. (for stocks of Japanese tin only). Detailed information about delivery may be obtained from the secretaries of the Combined Tin Committee or from the Directorate of Non-Ferrous Metals, 20 Albert Street, Rugby. All procurement against first half allocations should be completed by July 31, 1947, at which time unsold tonnages will revert to the pool for reallocation.

New U.S. Sulphuric Acid Plant

Construction has begun on a new plant for the manufacture of contact sulphuric acid by International Minerals & Chemical Corporation as an addition to its fertiliser and acidulating plant at Lockland, Ohio. Construction is expected to be completed in time for operations to begin by the first of next year. The new buildings will be a compact, modern unit measuring approximately 100 by 170 ft. with an annual capacity of 45,000 tons.

Acid Plant for Ceylon

Dr. Underwood Consulted

MR. D. H. BALFOUR, Director of Commerce, Ceylon, who is retiring, has asked the Minister of Labour, Industry and Commerce, for permission to cable the Crown Agents in London to engage the services of Dr. A. J. V. Underwood for the preparation of estimates for a 2000-ton sulphuric acid plant.

Dr. Underwood, who was recently in Ceylon, having been invited by the Government to give his expert views on the matter, prepared plans for the manufacture of caustic soda and chlorine, the estimated cost of which was Rs.2,600,000, excluding the cost of site, services and communications. The scheme, which envisaged the production of 1500 tons of caustic soda and 1300 tons of chlorine a year, was approved by the Executive Committee of Labour, Industry and Commerce.

Essential to Industry

Mr. Balfour, who now proposes to obtain his services to instal a plant of 2000 tons capacity for the production of sulphuric acid, explains that the proposed plant is the smallest economic unit that can be installed here. Sulphuric acid is an essential material for industry. Certain industries concerned with the manufacture of DDT, superphosphate manure, ammonium sulphate, and other chemical products will be dependent on the plant.

Sulphuric acid, states Mr. Balfour, is a chemical on which transport costs are prohibitive and it is not possible to depend on imported sulphuric acid for economic development. The raw material for sulphuric acid manufacture is sulphur or iron pyrites of which there are no indigenous supplies. The Island's present consumption of sulphuric acid is approximately 150 to 200 tons per annum. Until the dependent industries are brought into full production the proposed plant will be unable to work at full capacity; it will therefore be constructed in stages, the first of which will cost £500.

Enterprising Factory

Stating that the future is bright for the factories run by the Government of Ceylon, Mr. W. J. A. Vanlangenburg, acting Director of Commerce and Industries, states that the Government's acetic acid factory is the most interesting and enterprising industry under its control. Acetic acid, phenol for disinfectants, creosote for wood preservatives, alcohol for methylated spirits, acetones, paint solvents, and a synthetic bitumen for coconut shells. These industries are entirely original, says Mr. Van Langenburg, and not duplicated in any other parts of the world. Other research work is still in an experimental stage.

Chemical and Allied Stocks and Shares

THE moderate rally which followed the sharp reaction in British Funds had a beneficial influence on stock markets as a whole, steadier conditions developing, although buyers were still proceeding cautiously in view of international affairs.

Imperial Chemical at 50s. 6d. attracted buyers, attention being drawn to the fact that on the basis of last year's 10 per cent distribution, which it is generally expected is likely to be maintained, the yield now exceeds the return on a number of other chemical shares. In fact, according to some views Imperial Chemical would not be over-valued at 60s. on which basis the yield would be 3¼ per cent. Monsanto Chemicals 5s. units were 59s. 9d. and Greeff-Chemicals Holdings 5s. units 17s. 6d. B. Laporte were £5 and W. J. Bush 93s. 9d. After easing, Borax Consolidated deferred strengthened to 60s. 3d., and a good feature has been provided by a strong advance from 21s. to 23s. 6d. in British Glues and Chemicals 4s. shares on current market dividend estimates. De La Rue were 63s. 1½d. but the units of the Distillers Co. were dull at 146s. 6d., although estimates of the special final payment for the past financial period (which is to be announced next month with the consolidated accounts) range up to 5 per cent, which would raise the total payment to 25 per cent. British Aluminium at 49s. 7½d. regained part of an earlier decline, and elsewhere there was a better tendency in paint shares, Goodlass Wall rallying to 41s. 4½d., while Pinchin Johnson were 63s. and International Paint £8½.

Iron and steels failed to attract much attention despite the good yields at current prices, sentiment being governed mainly by the surrounding reaction in markets, although the prevailing view in the city is that in the event of nationalisation, fair compensation would justify prices well above those now current, the latter having been depressed by uncertainties as to Government policy and plans. United Steel, for instance, which have recently gone back to 24s. 10½d. with the trend of markets, are said in some quarters to be worth fully 30s. On the other hand, Hadfields have rallied to 23s. 6d., Colvilles were 26s. 3d., and Stewarts & Lloyds 53s. 6d. Textiles have failed to derive any stimulus from the big export plans, although following their recent decline, Fine Spinners strengthened to 29s. 3d. Calico Printers were 21s. 4½d. and Bleachers 11s. 9d.

British Oxygen rallied to 108s. 1½d. and Boots Drug were better at 64s. 9d., the assumption being that when more capital is required it is likely to take the form of an offer of additional preference shares to shareholders. Rumours have been current that the last-named company may be contemplating extending its interests in the Dominions. Turner & Newall have become steadier at 89s. 6d. United Molasses were 56s. 1½d., but Wall Paper Manufacturers deferred eased further to 55s. 3d. Sangers were better at 38s. Glaxo Laboratories changed hands around £25½ and in other directions, Hardman & Holden 5s. ordinary were 32s. 7½d. Fisons have been firm at 67s. 6d. on the new capital plans, and elsewhere after their recent decline to 52s., Lever & Unilever rallied to 54s. 6d.

British Plaster Board eased to 30s., Associated Cement were 74s. 6d. and elsewhere Dunlop Rubber, after receding to 77s. 6d., firmed up on official news of the shortage of tyres. Triplex Glass 10s. ordinary were 33s. 9d.; the market is uncertain whether profits are recovering from the set-back shown a year ago.

British Chemical Prices

Market Reports

London.—A steady demand has been reported for industrial chemicals during the past week with little change in the general supply position. Prices are mostly firm and the only changes of note that have come to hand at the time of this report is an increase in the quotation for sodium metasilicate to £18 per ton delivered and a reduction in the price of cream of tartar which is now quoted at £10 1s. to £10 5s. per cwt. according to quantity. Scarcity of offers continues to affect activity in the coal-tar products market where, generally speaking, current production is required to cover existing commitments.

Manchester.—Holiday conditions in various Lancashire cotton towns continue to have a seasonal influence on the demand for textile chemicals, but in spite of this factor supplies of these and of most other descriptions of heavy chemical products seem to find a ready outlet among home trade users and for shipment as they become available. Fresh inquiries during the past week have been on steady lines. Apart from the advance in industrial nitrate of soda, prices generally are much the same as before, with the undertone firm in most sections. In the tar products section steady pressure for deliveries is reported in the general run of light and heavy materials.

Glasgow.—The Scottish chemical market is displaying great activity in all sections. In the home market demand has been heavy for all classes of chemicals, particularly for white barytes, which is still in short supply. In the export market a number of orders have again been booked and inquiries continue to be heavy. One of the main difficulties in home trade is the high railway freight rate which greatly restricts sales that might otherwise have been made.

New Styron Plant

WITH the opening recently at Sarnia, Ontario, of the new $1,000,000 Dow Styron plant, another link was forged in the interlocking chain of chemical industries predicted for the St. Clair valley. Simultaneously with its opening the new plant turned out its initial batch of coloured Styron.

The Dow plant, which uses a completely new and unique process for the polymerisation of styrene, is already turning out plastic moulding powder at a rate of 500,000 lb. per month.

The Dow Chemical of Canada announce that construction has already begun on a $3,000,000 glycol plant, and that a $5,000,000 chlorine plant is planned nearby.

The Standard Chemical Company, Toronto, has arranged to buy a 50-acre plant-site north-east of the Styron plant, while the Sun Oil Company, Ltd., will purchase land on the river bank for future development. Standard Chemicals will manufacture chlorine and caustic soda, and obtain power, steam and water from the polymer power plant and pumping station.

The design of the process equipment, according to Dr. B. B. Hillary, plant superintendent, is the result of years of work by Dow research men and engineers. It is essentially a mass polymerisation process and instrumentation for automatic control and recording has been developed almost to the ultimate degree of perfection. After polymerisation the polymer is ground and coloured by conventional means. Great care has been exercised in testing and selecting dyes and pigments which will be heat and colour stable. Colours are carefully matched to standards in the laboratory so that the customer can always be certain of obtaining the same colour.

The very elaborate General Electric recording spectrophotometer is used to eliminate the possibility of human error in colour work.

Flax Seed Plastics

Chemists at the University of Saskatchewan are making plastics from flax seed, possibly the first made from that grain. Within a year or so, if all goes well, they hope to produce a plastic which combines strength, durability and water resistance.

Both Dr. E. Y. Spencer, associate professor of chemistry at the university, who is directing the work, and Claude R. Usher, senior chemical engineering student, who is carrying out the experiment, emphasise that their plastics are not yet perfect.

Dr. Spencer, a cereal chemist, has been doing research on the chemical composition of West Canadian cereal crops. His laboratory has been analysing flax meal samples from the Saskatchewan Wheat Pool's vegetable oil plant for protein content. From this work developed the experiments in the manufacture of the plastics.

Practically all of Canada's crop—in 1945 it was 7,593,000 bushels valued at $18,528,000, a sharp decline from 1943 when 17,911,000 bushels were produced—now goes into feeding of livestock. But bigger crops, less demand for feed and other factors may some day eliminate much of this demand and an industrial market take its place, particularly if it proves valuable in plastics.

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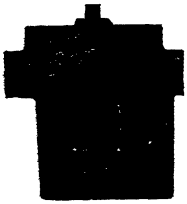
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Telegrams: ALLANGAS FLEET LONDON
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SCOTTISH OFFICE:
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MIDLANDS OFFICE:
Daimler House, Paradise Street. Birmingham (Midland 0784-5)

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Utilisation of Coal

LAST week's Symposium on coal and petroleum held at Scotland's oldest university, dealt thoroughly with the methods which have been developed for using coal and petroleum for other than purely heating purposes. Some of the papers presented during this meeting are reported in this and previous issues and give many interesting facts concerning different processes for utilising these two raw materials. At the present stage in our national economy, however, it is wiser to view the question of the utilisation of our coal resources from the economic rather than from the purely chemical point of view.

The Fuel Research Board has estimated that the reserves of coal in Scotland alone amount to 9,620 million tons and that since the pre-war annual output was only of the order of 30 million tons—and is now less than that—we have enough Scottish coal to last for another 300 years. We therefore see that there is no immediate prospect of our running out of coal—the limiting factor at the moment is the amount of coal which can be brought to the surface. Since we cannot obtain all the coal we require at the present time it is only prudent that our limited stocks should be used to the best advantage. We may note in passing that of the annual coal production target of 200 million tons, 45 millions are for domestic purposes. No one will deny that this is an inefficient way to use coal but since the open fire is a symbol of British home life such a national extravagance is tolerated even if rationed.

Much has been written recently on the Fischer-Tropsch reaction, mainly owing to the discovery that it had been used by the Germans on a large scale during the war with great success. This is a versatile process and starting from a mixture of carbon monoxide and hydrogen either petrol or a range of aliphatic chemicals may be produced. Owing to our need to conserve dollars the importation of petrol has been restricted and it might seem at first sight that this reaction would relieve the shortage. Further inspection shows, however, that in order to make one ton of petrol five or six tons of coal are required and this, therefore, cannot be considered as a suitable process. It must be stressed that the economic consideration of any reaction must be made with a full understanding of local conditions. Whether a process is economic in Germany, Great Britain or the States are three completely different cases each to be treated on its own merits. This is illustrated firstly by the fact that 80 octane petrol may be made directly by a Fischer reaction in the States using their abundant supplies of natural gas, and secondly by the fact that in the States they use methane as a source of hydrogen while in this country we produce methane from coal.

It sometimes happens that a synthetic article may be more expensive than a product made from natural sources and at the same time less efficient. Clearly such an article will not command a ready sale if in competition with the natural product. A case in point was the production of soap in Germany by the Fischer reaction before the war. Even though this soap was not of very high quality it cost the equivalent of sevenpence a tablet. In the case of some of the newer plastic materials these have properties which are in some cases

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superior to the natural article and will, therefore, find a ready sale even if the price is on the high side. Such a compound is polythene, now universally accepted to be the best solid dielectric material and widely used in the manufacture of radio equipment and submarine cables in which it has replaced gutta-percha.

The production of synthetic petrol by the Fischer-Tropsch and hydrogenation reactions has been one of alternating supremacy and although some years ago the hydrogenation procedure was the only method capable of giving good quality petrol the position has now been reversed in the States owing to the development of a fluid iron catalyst and on account of their favourable situation regarding natural gas.

The profitable operation of any process depends to a large extent on the utilisation of by-products which, in the case of petrol production, comprises a gas containing large quantities of methane. Such a gas has a high calorific value and if this can be sold it enables petrol to be produced in the States at a cost of 7 cents per gallon, at which price it is capable of competing with the natural product, as against 9 cents per gallon if the gas is not utilised. The Germans also realised the importance of utilising any by-product gas and, in the operation of the Fischer reaction to give petrol, distributed a gas of 450 B.Th.U. over the Ruhr gas grid system. This had the effect of reducing the net amount of coal consumed to $4\frac{1}{2}$ tons per ton of petrol, but even so this petrol was more expensive than the product obtainable from natural sources.

Those who are responsible for the planning of the coal industry should therefore encourage the use of coal for the manufacture of those products which have a high export value and at the same time consume comparatively little coal in manufacture. It would, therefore, appear to be more profitable from a national point of view to continue to import petrol from dollar areas and to use our present limited supplies of coal to build up a valuable export trade.

In 1937 the third report of the "Oil from Coal" Committee appointed by the Scottish colliery owners reported that of the various proposals for treating coal with the object of producing derivatives none warranted sufficient promise, from the business point of view, to justify economic exploitation. It has been made amply clear at St. Andrews, and on other occasions, that British research has developed many processes for using coal, just as the Americans have in the case of petroleum, and in the middle 1930's a British counterpart of the Fischer-Tropsch process was operated in Scotland. Despite the excellence of the process and the plant, the scheme failed owing to lack of Government support, although in 1936 the Scotland Development Committee urged the Government to back such an enterprise. It was very strongly urged at St. Andrews that in order to avoid such another failure a Government subsidy should be granted, at least for development work to be carried out.

In concluding the Symposium a resolution was passed that the Royal Institute of Chemistry should approach H.M. Government with a view to requesting them to set up a committee to investigate the chemical utilisation of coal, a step with which we are in full agreement.

NOTES AND COMMENTS

Fraternity

THE opening at the Central Hall, Westminster, on Tuesday of the centenary celebrations of the Chemical Society brought home with renewed force the realisation of a peculiar quality of chemical study, not altogether new perhaps, but seldom so conspicuously apparent. This concourse of nations—a little UNO, in fact—exhibited in a diversity of incidents what has so often been wanting in its much publicised prototype: a readiness of many races to give credit to each other's point of view and to acclaim achievements, regardless of creed, colour or language. This clearly is one of the special privileges of chemistry and if the science conferred on humanity no greater gift than this it would still have amply justified its existence. Of the many recollections borne away from Tuesday's ceremony the most lasting, we believe, will be of this remarkable spirit of fellowship, which the president, Professor C. N. Hinshelwood, acknowledged when he condoled with Mr. Ernest Bevin on having missed, through his duties in Paris, a practical illustration of the sort of results for which he strove elsewhere. To Mr. Bevin, in particular, the spectacle of a Russian scientist—M. Nesmeyanov—presenting fraternal greetings to England on behalf of Soviet scientists, and himself receiving almost an ovation from the audience would have served as a much needed antidote to the antagonisms which have been the dominant characteristic in the political sphere. We may be thankful for the testimonies given this week that in the disinterested realm of pure science there are still no national boundaries.

The Exhibition

IT was a happy thought that one of the events connected with the celebrations of the centenary of the Chemical Society should be an exhibition showing chemical progress in the past 100 years. The thanks of the chemists are due to the Government for allowing the exhibition to be held in that most appropriate place—the Science Museum. The exhibition itself is not large, but it is a most interesting collection of original apparatus and models and shows the achievements of British chemistry during the past century. The first part illustrates the great advances that have taken place, and includes many of the most famous objects in the history of British chemistry, collected from scientific institutions, the universities, museums and industrial bodies. Among famous chemists whose work is illustrated is Faraday, whose discovery of benzene in 1825 paved the way for the production of a host of new substances used in making dyes, drugs, perfumes and explosive materials. The romance of the discovery and preparation of artificial dyes is also shown, and includes Perkin's preparation of the first coal-tar dye "mauve," discovered in 1856. The story of the familiar electric sign, so much in use to-day, is taken back to pioneer work on the rare gases, of which the red "neon" light, discovered by Ramsay in 1898 is a spectacular example. The first preparations of artificial rubber are included and many other interesting objects in the history of chemistry during the past 100 years are shown. Each branch of chemistry has been under the care of a panel of experts composed of leading scientists of the day.

A Modern Section

A MODERN and popular section of the exhibition, prepared by the Department of Scientific and Industrial Research, deals with the applications of chemistry to everyday life. It includes sections dealing with such themes as textiles, agriculture, homes and buildings, roads and transport, fuel and power, health and food. Linking the two parts of the exhibition is a special display explaining the processes by which the chemical engineer turns raw materials into products familiar to everyone. The cooperation of the leading research associations has been secured for this part of the exhibition and the Central Office of Information has undertaken the design and layout. The exhibition constitutes one of the most comprehensive displays in the history of science yet seen in this country. In addition to providing information of interest to the more scientific visitor it serves, by means of its more popular exhibits, to emphasise to the general public the many benefits, and the far-reaching effects on their lives, resulting from the scientific discoveries of their countrymen.

Telling the World

THE Chemical Society has never courted publicity. From the viewpoint of the general Press its reticence is probably regarded as verging on the eccentric in an age when atom bombs and "flying saucers" are the staple stuff of headlines. No one this week, however, can fairly accuse the Society of shunning the Press or the public gaze, in view of the fairly ample and farseeing preparations it appears to have made to ensure the significance of its centenary celebrations and of the Congress of Pure and Applied Chemistry is widely recognised. The public in general is just now more keenly interested than ever before in the scientific background to daily life and is entitled to be told what value attaches in the present troubled picture of current affairs to this week's assembly in London of men of this country and 28 others whose achievements in the field of pure chemistry have made their names familiar, even though the importance of their contributions may not be generally appreciated. The Press conference conducted by Sir Wallace Akers on the eve of the congress and of the celebrations indicated that if the public at large does not receive a fairly ample and balanced picture of recent extraordinary progress in chemistry now being revealed after nine years' silence it will not be the fault of the organisers. In this connection it is as well to emphasise that the congress has put no ban on atomic energy papers, as was stated in an evening newspaper last week. The only restrictions on discussion of this subject are those embodied in the Atomic Energy Bill. Each of the sections of the congress has its "interpreter" qualified to answer questions and elucidate various points raised by the papers. British chemists have certainly done their best to ensure that this and next week's events are not run on the "closed shop" principle and that those who are not chemists share as far as is possible in the exchange of chemical news. Good psychology, in this connection, was the decision to open the centenary exhibition at the earliest opportunity—July 20—to the public at large. It should help to widen chemical perspectives the easy way.

B.I.O.S. REPORTS ON JAPAN

A NUMBER of short reports of five to eight pages each have recently been issued by H.M. Stationery Office on several Japanese chemical companies. These reports, which originate from the Military Intelligence Section, G.H.Q., Supreme Commander for the Allied Powers, although containing a useful array of facts and figures relating to the history, ramification, and annual production of particular targets, are by no means as lucid and comprehensive as those written by expert teams on the German chemical industry.

The Electro-Chemical Industrial Co., Ltd., Tokyo, is stated to be producing cyanamide at an annual rate of 110,000 tons, but is expected to increase its output to 160,000 tons after the installation of nitrogen separators. It is said that plans have been made for producing cement and sulphanile products. When the report on the Tokuyama Soda Co., Ltd., was being prepared, the company's operations were at a standstill because of bomb damage, but it is thought to be capable of resuming work when materials and fuel become available. The company—one of four making soda by the ammonia process—also manufactures soda ash, common salt, calcium chloride, sodium silicate, gypsum and cement. The absence of reference to improved processes and techniques, or remarks on the efficiency of the plants visited, manufacturing costs, welfare and safety arrangements would seem to indicate that little information of importance has been gained.

Industrial Paints on Test

A PAINT research programme which is capable of saving much expenditure on maintenance in the U.S.A., is being carried out by the Dow Chemical Co., and Sherwin-Williams, at Freeport, Texas. Originally, the intention was to find the most suitable paints for exteriors for Dow's large chemical plant at Freeport, but the results may be of general application in the chemical, petroleum, and other industries.

The paints used hitherto have not withstood satisfactorily the severe conditions attending the production of bromine, magnesium, synthetic rubber, and ethylene products. Whereas the ordinary life of industrial paints under average conditions is about five years, few of those used at Freeport had lasted longer than twelve months.

Some fifty different primers and finishes are being tested on 1500 paint-outs and test panels in ten different areas, subjected to controlled and characteristic chemical and atmospheric conditions.

CHEMICAL SOCIETY CENTENARY

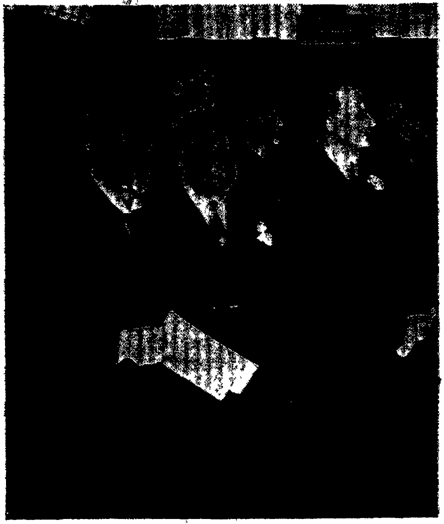
Exhibition—Reception—Centenary Address—Dinner

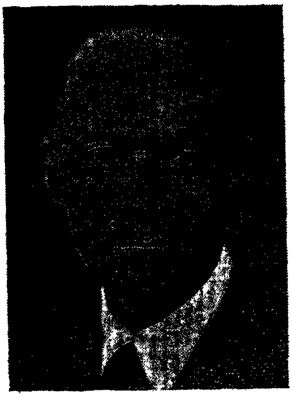
THE three days of ceremonies to celebrate the 100 years existence of the Chemical Society began in grand style on Monday morning when an exhibition showing the principal events in the chemical history of the last 100 years was opened by the president of the Society, Professor C. N. Hinshelwood, at the Science Museum.

The Minister of Education, Mr. G. Tomlinson, in asking the president of the Chemical Society to declare the exhibition open, said:—

I am delighted to welcome here the Fellows of the Chemical Society and their colleagues, who are here to celebrate the Society's centenary. All birthday parties are happy occasions; but learned societies have the advantage over human beings that, whereas the latter at their centenary may be excused if they face the future with speculation, tinged perhaps with anxiety, the former have no such fears and are only beginning to enter on their full vigour as they enter on their second century of existence. The older, like so many good things, the stronger and the better.

The 1840's were a vintage decade for the expansion of knowledge. A few weeks ago I had the privilege of entertaining in this museum the Institution of Mechanical Engineers at their centenary. To-day you are here as my guests on a similar occasion. It is fitting that the two events should so nearly coincide, for together engineering science and chemical knowledge represent two of the foundation stones on which the greatness of Great Britain as an industrial power was built, and on which it must continue to stand if—as it will—it is to retain and reinforce its economic and moral pre-eminence in those activities whose wise application to the problems of the world can mean so much in terms of human welfare.


Sir Robert Robertson, Mr. G. Tomlinson (Minister of Education), and Professor Hinshelwood at the Exhibition


Professor G. N. Hinshelwood. President of the Chemical Society

It is a very happy augury that, together with your centenary celebrations, the 11th International Congress of Pure and Applied Chemistry should be taking place in London. Knowledge recognises no frontiers, and this is one of the occasions when we can see this truth in reality. The Chemical Society counts over 7000 Fellows all over the world. To the congress there have come delegates from almost every country. Here in this gathering is the expression of international friendship and co-operation at its best. It serves no narrow national purpose; it pursues knowledge in a spirit of friendly rivalry and with a deep sense of its responsibility to the peoples of the world. When the nations can work at the political level in the same unselfishness and zeal for a common purpose as your Society, and others like it, show for the advancement of learning, then the world will at least be on the way to the kind of society which we as members of the United Nations, through UNESCO, and the other specialised agencies, are trying to build.

The learned societies play a part in the cultural and intellectual life of the community, not only important but in a true sense vital. Not only do they represent both the advance guard of the human spirit, continually probing the frontiers of new knowledge by their researches, but they stand also, as it were, at the pinnacle of the educational pyramid, which begins in the primary school. To that pinnacle we are determined to make it possible for every boy and girl, if their desires and abilities can lead them in that direction, to aspire. In this pattern, and especially at its higher levels, teaching and research are inextricably linked. I count it of the first importance that those who teach at those levels should periodically refresh their minds and their knowledge by undertaking original research.

Upstairs in the present exhibition you can see some of the landmarks in the progress of your science in this country during the 100 years for which your Society has existed. Beyond everything else it teaches how closely the search for new facts is related to the more day-to-day things which form the background of our daily lives. In very truth the chemical adventurers of yesterday are the fathers of the chemical industries of to-day. We need look no further than the list of presidents of the Chemical Society, chosen by earlier Fellows for their ability for leadership in chemical research, to realise this truth. The names of men like Sir William Perkin, Lawes, Gilbert and Sir William Ramsay testify to it. I know that this line will continue with yet greater distinction.

In 1841, when the Chemical Society was founded, Thomas Graham, Professor of Chemistry at University College, London, was your first president. In 1847 he was again president of your Society. Nothing could be more fitting and nothing could give me more pleasure than that I should now ask his successor, that very distinguished scientist, Professor C. N. Hinshelwood, the president of your Society in its centenary year, formally to declare this exhibition open.

In opening the exhibition, Professor Hinshelwood said:—

I must first, on behalf of the Chemical Society, thank the Minister very much for the courtesy to the Society in receiving us here and for the stimulating words which he has said to us.

An exhibition is defined as a display of objects of beauty or interest. I must thank the director and staff of the Science Museum for what they have done.

Referring to the fact that to derive full benefit from the exhibition we

A Modern Plant on show at the Exhibition.

The experimental plant used by the Department of Scientific and Industrial Research for the synthesis of oils by the Fischer-Tropsch process. By this process large yields of oil are obtained from coal without the use of high pressures. Motor spirit and diesel oils are obtained directly, and lubricating oil can be prepared from the synthesis product

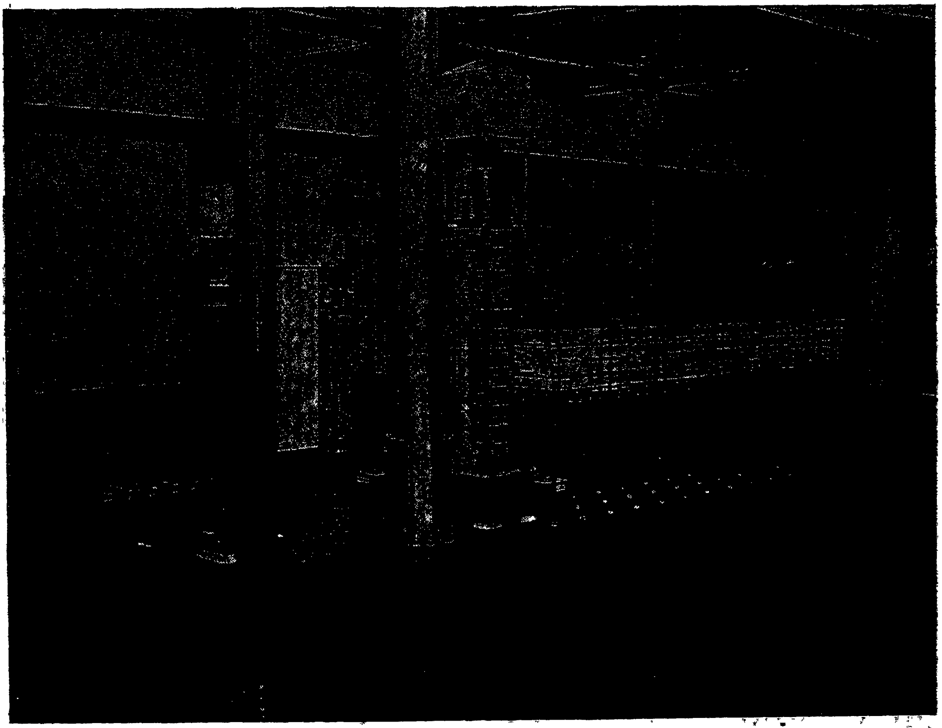
must rely essentially upon the associations which those objects have for us, Professor Hinshelwood said the only real person to write up this exhibition would be Hans Anderson. What conversations he would have made these objects have among themselves. We must let our fancy play over the exhibition, and we shall have the whole history of chemistry evoked for us.

One section of the exhibition is devoted to the relation of chemistry to our daily lives. This will have a more immediate appeal to the public in general. It will show them what they owe to chemistry in matters of health, amenities and every aspect of their daily lives. It is fair to point out that anything which has been derived in that respect would never have existed without the rather recondite and obscure-looking objects which are displayed in the historical section. Books are also displayed. They are the very lifeblood of science. It is a rather sad reflection of the times that we now come to museums to see the books which we used to buy.

All the great advances of the last century came from men with independent vigorous minds. The machine with which we now have to work is enormously powerful, and we hope it will yield greater results. But it will still be the originality and independence of men's minds which will determine what happens. In response to the kind invitation of the Minister, I declare the exhibition formally open.

Sir Robert Robertson, chairman of the Exhibition Committee, thanked the Minister and staffs of the Chemical Society and the Science Museum for their work in connection with the exhibition.

Mr. Tomlinson, replying to the thanks, referred laughingly to the fact that it was a Monday morning and he had not thought it possible to gather so many people together to visit an exhibition on that day. Speaking on the book section of the exhibition, he said we produce so many books and so few people read them—and that goes for Government circulars, too!



A Model of an old sulphuric acid plant. This was put up in 1866 to produce chamber acid of 60-70 per cent H_2SO_4

World Honours the Chemical Society

THE ceremonial opening at Westminster on Tuesday of the centenary celebrations of the Chemical Society afforded most impressive evidence of the integrity of chemistry and of chemists, which seems to be secure in the face of all disruptive influences —different languages and conflicting social and political "ideologies." This, even more than the dignified pageantry of the processional entry of the delegates, led by the president of the Chemical Society and the mace bearer, was the predominant impression.

The president of the Chemical Society, presiding over the ceremony, was evidently as conscious as the audience that this spirit of international solidarity in one field at least was fully as important as anything else the celebrations and the chemistry congress can hope to achieve, and he summed up very appropriately what was in everyone's mind when he said regretfully that Mr. Ernest Bevin's preoccupations in Paris alone had prevented him being there "to see the sort of results for which he strives."

International Recognition

In addition to the cosmopolitan character of the participants and spectators, suggesting a full meeting of UNO rather than an incident in one country's affairs, there were other convincing evidences of the temporary obliteration of nationalistic prejudices and of the honour in which the society is held by chemists all over the world. The presentation of written addresses by the representatives of learned societies of more than 30 countries and of a long verbal address in warm terms by Professor R. Delaby on behalf of the Société Chimique de France, were the most impressive. In addition, several countries, feeling perhaps that the cordiality of their feelings could not he adequately conveyed on a parchment, accompanied their addresses with gifts to the society—from Sweden a magnificent example of Swedish glass inscribed with chemical symbols and with the name of the Chemical Society, from South Africa an inkstand of decorative stinkwood.

From H.M. the King came a personal message, read by the president, sincerely thanking the Council and Fellows of the Chemical Society for their kind and loyal message and recording the King's appreciation of the work which the society is doing for the common good.

Greeting the delegates, who with their friends nearly filled the spacious ground floor of the Central Hall, the president recalled the formation of the society just over 100 years ago by 25 chemists led by Robert Graham, who would, he surmised, be surprised to see to-day the size to which their enterprise had grown. It was his privilege to welcome delegates from all over the world, who were tangible evidence of the unity of science in all countries. This suggested that when people had something worth while to occupy them they could live and work together in amity. In greeting the overseas delegates he felt he was welcoming old friends, and it was gratifying to record that that day in Peru the Chemical Society of Peru was holding a meeting, at which the British Ambassador would be present, in honour of the centenary of the British Chemical Society.

Sir Robert Robinson, expressing, as president, the greetings of the Royal Society, spoke also on behalf of the other learned societies having close associations with the Chemical Society. It was noticeable, he said, that many of the societies now presenting addresses owed their parentage to the Chemical Society, a special case being that of the Society of Dyers and Colourists, which was now reaching its manhood and was seeking a charter. There was no better example of the devoted endeavours of the Chemical Society. The most lively gratitude also was felt by individual chemists, who looked on the society "as their mother and father." On behalf of them he assured the society of "our filial devotions."

Congratulatory addresses, which will be on view at Burlington House, were presented by representatives of the following British organisations:

The Royal Society (Sir Robert Robinson), The British Association for the Advancement of Science (Sir Henry Dale), The Cambridge Philosophical Society (Dr. W. H. Mills), The Faraday Society (Prof. W. E. Garner), The Geological Society of London (Prof. H. H. Read), The Institute of Brewing (Mr. B. M. Brown), The Institute of Metals (Col. P. G. K. Gueterbock), The Institution of Chemical Engineers (H. W. Cremer), The Institution of Electrical Engineers (Mr. V. Z. de Ferranti), The Institute of Metallurgists (Dr. [illegible] Moore), The Iron and Steel Institute (Prof. T. Turner), The Linnean Society (Prof. G. R. de Beer), The Manchester Literary and Philosophical Society (Mr. H. Hayhurst), The Mineralogical Society (Dr. W. Campbell Smith) The Oil and Colour Chemists' Association (Dr. H. W. Keenan), The Pharmaceutical Society (Mrs. J. K. Irvine), The Physical Society (Prof. G. I. Finch), The Royal Astronomical Society (Mr. D. H. Saddler), The Royal College of Surgeons (Sir Alfred Webb Johnson), The Royal Entomological Society (Dr. C. B. Williams), The Royal Institute of Chemistry, The Royal Institution (Prof. E. K. Rideal), The Royal Photographic Society of Great Britain (Dr. H. Baines), The Royal Society of Arts (Sir Harry Lindsay), The Society of Chemical Industry (Dr. L. H. Lampitt), The Society of Dyers and Colourists (Dr. C. A. Whittaker).

FROM OVERSEAS

Addresses from overseas societies were presented by the following:—

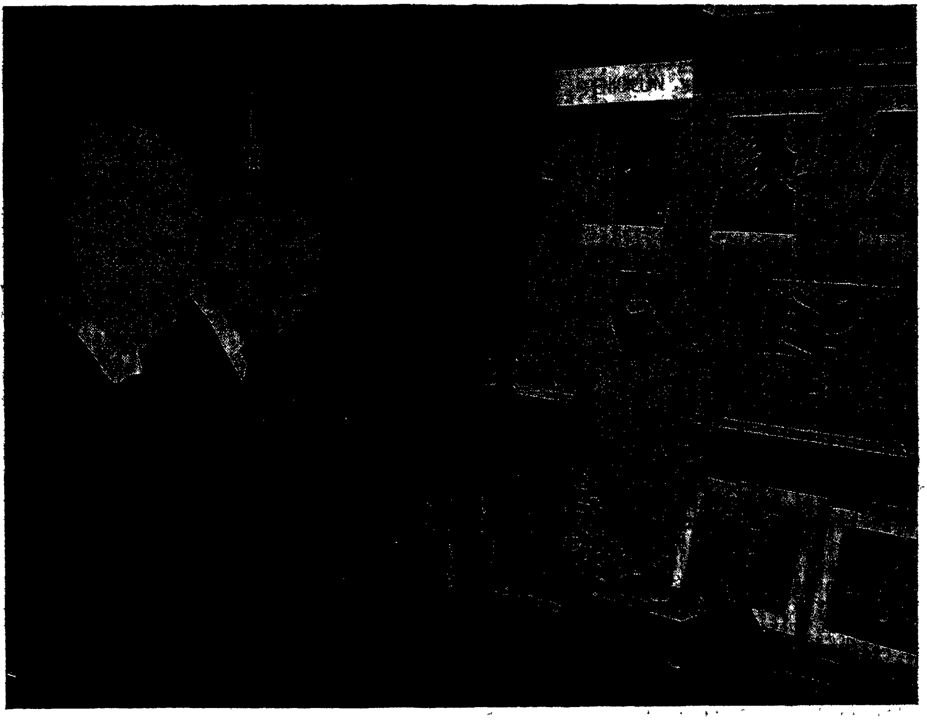
Asociacion Quimica Argentina (Dr. Venancio Deulofeu), Australian Chemical Institute (Dr. H. H. Hatt), Société Chimique de Belgique (Prof. J. Timmermans), Chemical Institute of Canada (Dr. Paul E. Gagnon), Chinese Chemical Society, Nanking (Prof. Fan-Hsuin Lee), Sociedad Colombiana de Ciencias Naturales (Dr. A. E. Alston), Ceska Chemicka Spolecnost (Prof. J. Heyrovsky), Kemisk Forening, Copenhagen (Dr. H. Jorgensen), Royal Irish Academy, Dublin (Prof. T. S. Wheeler), Irish Chemical Association (Dr. V. C. Barry), Fouad I

National Research Council (Dr. Ahmad Bey Zaki), Suomen Kemist Seura, Helsinki (Baron John Palmen), Société Chimique de France, Paris (Prof. R. Delaby), Société de Chimie Industrielle (M. Robert Bienaimé), The University of Salonika, Society of Icelandic Chemists (Dr. Björn Johannésson), Societa Chimica Italiana (Prof. D. Marotta), Indian Chemical Society, (Dr. S. Krishna), Nederlandsche Chemische Vereeniging (Prof. J. Coops), Flemish Chemical Society (Prof. B. Breckpot), New Zealand Institute of Chemistry (Mr. P. White) Norsk Kjemisk Selskap, Oslo (Prof. E. Berner), Sociedad Quimica del Peru (Señor Morales Macedo), Polish Chemical Society, (Prof. O. Achmatowicz), Chemical Society, Stockholm (Prof. H. Erdtman), Royal Swedish Academy of Sciences (Prof. G. de Hevesy), Swiss Chemical Society (Prof. P. Karrer), The Chemical, Metallurgical and Mining Society of South Africa, South African Chemical Institute (Dr. W. E. Gooday), American Chemical Society (Dr. W. A. Noyes and Col. M. T. Bogert), The Chemical Society of Uruguay, The Soviet Academy of Science (M. Nismeyanov), and the Croatian Chemical Society.

Centenary Address

Prof. C. N. Hinselwood, president of the Society, delivered the Centenary Address before an enthusiastic gathering at the Central Hall, Westminster, S.W.1, on Tuesday at 3.30 p.m. He gave an historical survey of the Society's activities since its formation in 1841, mentioning the great financial difficulties encountered in the early days and the not always helpful need for direction and secrecy of recent years.

The Prime Minister, the Rt. Hon. C. R. Attlee, was the guest of honour at the Centenary Dinner held at the Dorchester Hotel, London, on Tuesday evening.



The Minister of Education looking at the exhibition penicillin stand

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ITALY SHORT OF CUPRO CHEMICALS

CONSIDERABLE delay in the arrival of copper supplies in Italy have reflected unfavourably on the production of copper sulphate. Fungicides should have been at the disposal of farmers in May, but the factories began receiving their copper only in April. This has led to considerable increase in prices which went as high as 130,000 lire per ton at the beginning of June. At present, however, the output has resumed a certain regularity and is forcing the price down.

The situation with oxide-chloride of copper powders needed in fruit and especially in grape culture, is worse, for the output is not likely to exceed 3000 yearly tons and no more than 33 per cent of the pressing demand can be satisfied. The same applies to the production of copper-sulphur compounds used against wheat-rot.

St. Andrews Symposium

CHEMICALS FROM COAL AND PETROLEUM

Summing Up of the Papers

By a Special Correspondent

DURING the week July 7-12 over 200 members of the Royal Institute of Chemistry gathered at the University of St. Andrews to attend a symposium on "Coal, Petroleum and their Newer Derivatives." The symposium was organised by a committee of the three Scottish local sections of the Royal Institute under the chairmanship of Dr. David Traill with Mr. A. R. Jamieson as secretary. The committee is to be complimented on arranging and carrying out such an ambitious and entertaining programme.

The symposium was opened by the Principal, Sir James Irving, and his remarks together with a review of some of the papers have been given in THE CHEMICAL AGE (July 12, p. 39).

Synthetic Petroleum Production

The first paper to be presented was by Major Kenneth Gordon, of the I.C.I. Billingham Division, on "The Production of Petroleum by Synthetic Methods." In his opening remarks the speaker said that there are two main methods for the production of petrol; either from coal by breakdown or by a synthetic process of the nature of the Fischer-Tropsch method. In the case of the production from coal it was essentially a case of direct hydrogenation since the empirical formula of coal is $CH_{0.5}$ while that of petrol is CH_2 and the process resolves itself into a means for introducing the extra 1½ atoms of hydrogen, which is normally done under a pressure of 250-300 atmospheres.

Owing to the difficulties of introducing a solid into high pressure apparatus, if coal is to be used as the raw material it is powdered and mixed with oil to give a paste from which the oil may be recovered by recycling. Although coal has been used as the raw material at Billingham it has now been superseded by creosote oil and tar, as the coal caused great abrasion of the plant and also during the war it was safer to carry out emergency shut-downs in case of air attack with an all-liquid feed. When coal is used as the raw material it is washed by flotation in order to reduce the ash to a minimum. Owing to the heterogeneous nature of coal about 5 per cent avoids hydrogenation, although this figure may be increased if the coal is alkaline since alkalis have an adverse affect on hydrogenating processes. As the removal of any unhydrogenated material is a difficult operation it is usual to treat the coal with a small excess of hydrogen chloride—introduced as ammonium chloride—to reduce this tendency to a minimum.

The ideal method of hydrogenating coal is to use four stages, although a satisfactory product may be obtained using two, while at Billingham three stages are employed. In the initial stages the catalysts employed in the hydrogenation are tin oxide and iron sulphide while in the final stage tungsten sulphide is used as this is a very active catalyst.

Petrol consists mainly of pentanes and some butane, and providing hydrogenating conditions are not too drastic only a small percentage of lower hydrocarbons is [illegible]. When coal or tar oils are hydrogenated [illegible] is found that the fraction boiling up to [illegible]°C. is purely hydrocarbon in character while above this temperature phenols and basic substances are obtained. The yield of petrol from coal will depend on the type of coal used and the quality of the petrol required. On an average, bituminous coal will give about 50 per cent conversion although this figure will be slightly increased if the petrol is for motor spirit, and lowered if for aviation spirit. German plants during the war had an annual output of 4 million tons of petrol while the combined output of Billingham and Heysham is half a million tons. Petrol obtained by this method has, without special treatment, an octane number of 80 which, by the addition of lead, may be increased to 95. In order to get an octane number of 100 iso-octane must be added.

Major Gordon pointed out that the immediate prospects for this type of process are less favourable than they were 20 years ago mainly owing to the large increases in the cost of coal and labour coupled with the fact that the petrol sold to-day is of a higher quality than formerly. Finally, the speaker dealt with the synthetic aspect by the Fischer-Tropsch reaction.

Synthetic Fibres

Since one of the greatest technological advances in the last few years has been the production of synthetic materials from coal tar chemicals it was fitting that Professor Astbury should be invited to speak on the "Evolution and Physical Interpretation of Synthetic Fibres." Members were intrigued by the first two slides which showed a section of a worm's skin under a microscope and an electron microscope, and these were used as examples of the highly symmetrical nature assumed by fibres in natural materials.

From this introduction the speaker showed, by means of many illustrated examples, how X-ray diagrams can be used to determine the orientation existing in synthetic fibres. He pointed out that complete irregularity gives pliable properties and this is only required for india rubbers, while too perfect orientation of the molecules gives a brittle nature. A successful plastic must therefore have an intermediate measure of orientation which will give it the optimum properties.

It was mentioned that the strength of fibres is largely due to chemical forces and that the strength of nylon can be attributed to the optimum conditions which exist for the formation of hydrogen bonds between carbonyl and amino groups in adjacent molecules, since both the acid and the amine used have an even number of carbon atoms.

Gasification of Coal

On the second day, Dr. D. T. A. Townend, Director of the British Coal Utilisation Research Association, gave an account of modern coal gasification developments. In view of the large number of different processes in use, he confined his remarks to the Lurgi process as being typical of a pressure-operated process. In such a plant the recovery of products is about 73 per cent coke, 18 per cent gas and 5 per cent tar.

Carbonisation means heating coal in a retort, and since the constructional materials and the coal are both bad conductors of heat this is wasteful. Gasification uses internal heat normally by burning part of the charge with air or oxygen. In the production of water gas it is now possible to combine the blow and make runs by using steam mixed with oxygen instead of air. Two main reactions may occur according to the temperature :—

(a) $C + H_2O = CO + H_2 - 29$ cal.

(b) $C + 2H_2O = CO_2 + 2H_2 - 19$ cal.

Reaction (a) occurs at 1100° C. and (b) at 600°-700° C. It is therefore essential to keep the temperature of the bed at 1100° C. since a lower temperature will result in the loss of calorific value of the gas owing to the high CO_2 content, while higher temperatures will reach the fusion point of the coal and cause clinkering. The temperature may be regulated by the rate of steam flow.

Methane by Direct Hydrogenation

Working at a pressure of 20 atmospheres increases the amount of methane, which is formed by a direct hydrogenation of the coal and not by synthesis, and this gives a higher calorific value to the gas; it also enables any CO_2 to be removed by scrubbing with water. Such treatment gives a uniform gas independent of the type of coal used. Since the Lurgi process goes best with coals of the lignite type, certain British coals need pre-treatment to prevent caking.

Dr. Townend also described how the Lurgi process may be operated to produce synthesis gas for use in the Fischer-Tropsch reaction which was then described by Dr. C. C. Hall, in the next paper, who dealt with its application to the production of a variety of synthetic products.

Since no industry can continue without power of some kind, it was appropriate that the symposium should be addressed by Mr. A. E. MacColl, deputy chairman of the North of Scotland Hydro-Electric Board. This speaker told the meeting that there was now a Government plan in hand for the provision of hydro-electric power in Scotland which ultimately would entail the building of about 200 power stations, and it was hoped that there would be an extra million kilowatts of electrical energy available by 1957.

Chemicals from Petroleum

An introductory contribution concerning conditions in the States was made by Dr. Gustav Egloff, of the Universal Oil Products Co. In his paper, Dr. Egloff told members that while in 1925 petroleum provided less than 0.1 per cent of the organic chemicals made and that in 1935 only one oil firm was registered as a chemical producer, these figures had risen in 1946 to 28 per cent and 50 per cent respectively. Of the 1700 million barrels of oil produced annually for heating, light and power, the use of less than 1 per cent made possible the production of 3800 million lb. of organic chemicals (excluding aromatic hydrocarbons). He then outlined the many substances of commercial importance which are now produced from petroleum and mentioned a new synthetic rubber known as "butyrubber" which he considered would be used in future for the inner tubes of tyres as it has only one-twentieth the porosity to air of natural rubber.

Plastic Materials

On the third day, which was devoted to chemical syntheses, the chair was taken by Professor Read, of the University of St. Andrews, and the first speaker was Professor E. R. H. Jones who outlined the recent advances in the chemistry of acetylene (details of this were given in last week's issue of THE CHEMICAL AGE).

Following this came Mr. Brown, of the I.C.I., Ltd., whose subject was vinyl compounds. This speaker dealt mainly with the production of the monomers from which such plastics are made. He showed the various ways in which such compounds as styrene, vinyl esters and acrylates could be made industrially, and stressed the fact that many of the processes depended upon acetylene as starting material. (This paper will be given fully elsewhere.)

Dr. R. Hill, of the I.C.I., Ltd., gave an account of the way in which nylon and similar compounds are made. In his talk he mentioned the necessary criteria for suitable monomers and the properties that an artificial plastic should have to render it of general use.

Dr. J. C. Swallow, of I.C.I., Ltd., in concluding this day's lectures, dealt with polythene. He stressed the point, as had also the previous speakers, that all these synthetic materials were of comparatively recent introduction and illustrated this by saying that in the case of polythene the first small-scale production unit went into operation on September 1, 1939, although more is now known about this material than some of the older plastics. He also made the point that the large-scale production of polythene, necessary during the war for radar equipment, had meant a great improvement in gas analysis apparatus and instrument control.

Polymers

The last group of lectures, under the chairmanship of Professor W. F. K. Wynne-Jones, dealt with the physical properties of polymers. The first speaker was Professor M. G. Evans who discussed the kinetics of polymerisation. He confined his remarks to compounds of the mono-substituted ethylene type, since most was known about this class of compound and for which a sound theory had been proposed.

Dr. Per-olof Kinnell, of Upsala, described recent methods for determining the molecular weight of high polymers. In addition to the ultra-centrifuge, he showed how osmotic pressure measurements may be extended to substances of high molecular weight by the use of a balance, and briefly mentioned the light scattering method introduced by Debye in 1943.

The last paper to be presented was by Professor Brønsted, of Copenhagen, who discussed the energetic properties of hydrocarbon mixtures and indicated how, by a thermodynamic study of the solubility of one hydrocarbon in another, an estimate might be formed of the percentage of crystallites in a sample of polythene.

On the final day there was a lively discussion on the week's papers when the economic implications of modern trends in the use of coal were stressed. This was followed in the afternoon by a visit to Comrie Colliery.

No account, however brief, of the symposium would be complete without a mention of the social side, which included lectures and conducted tours of St. Andrews and district, kindly arranged by members of the university, an informal reception by the city authorities and a formal dinner at the Grand Hotel.

Iron and Steel Figures Rise

A GOOD revival of iron and steel output in the second quarter of this year is shown in the recently issued figures. The total of steel ingots and castings, which is equal to an annual rate of 12,694,000 tons, compares with an equivalent of 11,231,000 tons a year in the first quarter. Considerable acceleration of production would, however, be needed to reach the average of 13,111,000 recorded in April-June, 1946.

Announcing these figures, the British Iron and Steel Federation stated that the higher rate of output in recent months has been achieved only at the cost of continued withdrawals from stocks of pig iron and steelmaking materials. The maintenance or increase of the level of steel production depends on increased supplies of coal.

Reports from Workington show that output of hematite pig iron in the north-west is now over 14,000 tons weekly and is expected soon to reach 15,000 tons. It has been made possible by the recent better supplies of coke. Output, it is estimated, could still be doubled without oversupplying the market.

Society of Chemical Industry

THE 66th annual meeting of the Society of Chemical Industry, to be held at the Connaught Rooms, London, will this year extend over four days, *i.e.*, from July 28-31 inclusive. Among the highlights of a comprehensive programme will be the president's commentary, " Ourselves and World Chemistry," at noon on July 29, and two simultaneous scientific meetings at 2.30 p.m. on July 30, one organised by the Agricultural Group and the other by the Plastics Group. A ladies' theatre visit has been arranged at Drury Lane for the same time. At 10 a.m. on July 31 there will be a scientific meeting organised by the Chemical Engineering Group.

In its report the council expresses the Society's warmest thanks to Dr. L. H. Lampitt who was elected president last year. Emphasis is given to his many years of service to the Society in various capacities. The council adds that it is quite sure " the direction of its affairs is in good keeping. Membership of the Society for the year ended December 31, 1946, rose from 6667 to 7077.

LARGE-SCALE PRODUCTION OF OXYGEN—IV*

Reducing Costs of Turbine Methods

by DAVID D. HOWAT, B.Sc., Ph.D., F.R.I.C., A.M.I.Chem.E.

THE expansion turbine is employed with considerable success to achieve a given amount of refrigeration in the large modern Linde oxygen plants, but this is generally a secondary or auxiliary application of the machine.

The important feature of the work carried out by Kapitza is the employment of the high-speed expansion turbine to provide all the cooling of the air, with a pressure drop of only about 5 atmospheres. Because of the low-operating pressure, the cooling effect produced is only 40 to 50° C. in place of the 130° C. characteristic of the Linde cycle. In view of the new and improved design of the Kapitza turbine it is claimed that these disadvantages attendant upon the use of low pressures may be eliminated. Further, the employment of the newer type of heat exchangers has led to a great improvement in technical efficiency.

Turbine Design

In essence the Kapitza turbine is based upon a design that in the past has been used only for water turbines, the blades being arranged between a pair of rotating discs. Directed radially inward to the turbine, the air flow passing the blades is deviated, leaving the turbine in the direction of the axis. In an effort to avoid the use of a multi-stage turbine with several rows of moving blades, Kapitza developed an extremely high-speed rotor, making about 40,000 r.p.m.

Kapitza claims[3] that his calculations show that owing to the high density of the air the dimensions of an expansion turbine must be kept small. A turbine handling 500 to 1000 cu. m. of air per minute (18,650 to 35,300 cu. ft.) at N.T.P. is fitted with a rotor only 8 cm. in diameter weighing 250 gms. With these small turbines it is difficult to give the blades the most favourable shape, straight blades being chosen for simplicity. Fig. 6, taken from Kapitza's paper[3], shows the design of the turbine.

To secure satisfactory thermal insulation of the bearings and to reduce losses the rotor is mounted on the free end of a flexible De Laval shaft, the other end of the shaft being supported by two bearings. Owing to the small dimensions of the expansion turbine the rotor must be constructed with great accuracy and must be very carefully balanced in view of the very small clearance between the rotor and the cover. Ensuring the necessary stability of the rotor involved considerable difficulties. A special damper, (Fig. 7), designed for use on the rotor, proved quite successful and with a clearance of 0.3 m.m. at the circumference of the rotor no mechanical contacts with the cover occurred, even with peripheral speeds of 180 m. per sec.

Two further points may be noted with reference to the rotor. First, to prevent the air flowing past the blades, two labyrinth glands (4 in Fig. 6), are provided, with a clearance of 0.15 m.m., the glands being of equal size at both ends to avoid axial pressure on the bearings. Second, the rotor shaft is mounted on ball bearings lubricated by drip. To reduce side pressure on the bearings as much as possible the rotor is fitted freely on the shaft, being able to move about its centre of gravity round the spherical end so that the principal axis of inertia automatically takes the direction of the axis of rotation. This free-

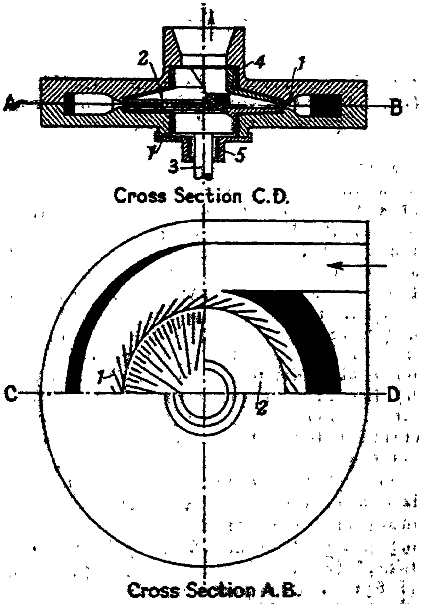

Fig. 6. High speed expansion turbine for liquefaction of air (Kapitza)

dom is limited by friction so that any accidental disturbances or vibration will be immediately damped by the stabiliser.

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* Parts I, II and III appeared on June 7, 14 and 28.

No useful work is wasted by the expansion turbine, the work being absorbed by a water-brake consisting of a small short circuited centrifugal pump with an adjustable intermediate orifice. This pump produces a pressure of 30 to 40 atmospheres, the pressure being read on a gauge, which in turn serves to indicate the speed of the rotor shaft.

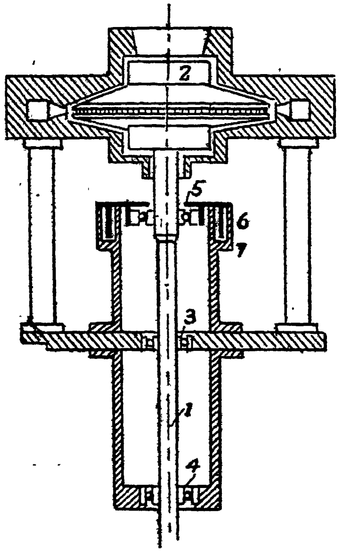


Fig. 7. Specially designed stabiliser fitted to rotor shaft of high-speed expansion turbine (Kapitza)

Kapitza states[3] that up to the time of writing (1939) the turbine had operated at 40,000 to 42,000 r.p.m. for a total time of over 700 hours, actual periods of operation being 7 to 8 hours while 570 kg. of air are treated hourly. On starting up, the turbine is loaded to 8 kW. the figure falling to 4 kW. at working temperatures. Pressure drop across the turbine is 4 atm. with the inlet air at 5.6 atm. The corresponding temperature differences are given as 115° K. for the inlet air and 86° K. for the outlet air, a drop of only 29° K. The thermal output of the turbine is given at 3720 cals. per hour.

The experimental installation for air liquefaction in which the expansion turbine is incorporated is shown in Fig. 8. The following is a brief outline of the cycle of operations. The filtered air intake is compressed to 6 to 7 atmospheres in the compressor (2) delivering 13.3 cu. m. of air per min. at 500 r.p.m. After passing through a water-cooler and oil-purifier (3 and 4) the stream of compressed air enters the exchangers (6), the cycle in the exchangers being 25 to 27 secs. The exchangers are of exactly the same type as those designed by Frankl.

The stream of cooled air from the exchangers is then divided into two parts. The major portion, after passing the filter and temperature equaliser (8) enters the expansion turbine (9) where it expands and then returns by the inner tubes of the condenser (10) to the other exchanger, escaping thence to the atmosphere. The other, smaller, portion of the compressed air stream is delivered through a check valve (11) to the condenser (10) where it liquefies. Liquid air is drawn off through a valve (12) into container (13), whence finally it is drawn off through tap (14). Any air evaporated on its passage to the condenser joins the flow leaving the turbine, its cold being utilised for the liquefaction of fresh intake of air.

Insulation

As is evident from Fig. 8, the condenser and liquid air container are insulated by a common vacuum insulation, a similar type of insulation being provided for the temperature equaliser (8).

Water for the cooling of the water-brake on the shaft is supplied under constant pressure from a tank (15). Rate of flow of the water is independent of any fluctuations in the main and the estimate of the output of the expansion turbine becomes more precise.

A certain degree of trouble arises from the blocking of the nozzles of the expansion turbine due to the deposition of solid carbon dioxide. The accumulation takes quite a time but as the cross-section of the nozzles is only 1 to 2 sq. m.m. even a very thin layer of solid carbon dioxide will seriously reduce the cross-section and impair the work done. The resulting rise in pressure may vary from 1 to 1.5 atmospheres.

This troublesome effect may be dealt with in two ways: (a) by the employment of a temperature equaliser. The partial pressure of carbon dioxide vapour is an exponential function of the temperature so that the concentration of carbon dioxide increases considerably in the temperature interval. In consequence, carbon dioxide enters the turbine practically only during the time when the temperature of the air leaving the regenerators attains its highest value.

These temperature fluctuations must therefore be reduced and it was found possible to make use of the heat of absorption of charcoal or silica gel for this purpose. A few kilograms of charcoal will suffice to equalise the temperature. With the reduced temperature fluctuations, only small amounts of carbon dioxide are deposited in the nozzles. For several hours the effect on the working of the turbine is not serious but the delivery of liquid air drops by several kilograms;

(b) By the employment of an electric heater. It is found more expedient to employ an electric heater intermittently than to utilise the temperature equaliser continuously. As soon as the pressure in the nozzles exceeds a certain definite value the air stream is diverted through by-pass (19) (Fig. 8), the flow to the turbine ceasing almost completely. At the same time the electric heater (17) comes into operation. Heating of the air continues for about 3 to 4 minutes and the warmed stream of air is passed through the turbine, evaporating the carbon dioxide. After this period the air is switched back to the main flow pipes and normal working is resumed. It is found that by-pass heating of the air becomes necessary at intervals of 1½ to 2 hours.

Pressure Losses

Kapitza states[3] that 29 to 30 kg. of liquid air are produced per hour on cycles of 7 to 8 hours operation (starting periods excluded). The air consumption is 9½ to 10 cu. m. per minute and the pressure drops. Thus, if the efficiency of compression is 0.59 the energy required for 1 kg. of liquid air is 1.7 kWh. Of the 7 atmospheres pressure drop 4 are taken up by the turbine, the remainder being wasted in the piping and exchangers. Accounting for these losses in the piping the power consumption is reduced to 1.3 kWh. per kg. of liquid air.

Further, in view of the fact that 0.85 of the output of the expansion turbine may be recovered in the form of useful work, the power consumption will work out finally to 1.2 kWh. per kg. of liquid air. By perfecting the thermal insulation and reducing a number of minor losses it is hoped to bring this figure down to 1.1 kWh. per kg. of liquid air. Although at low pressures only 5 to 6 per cent of the treated air is liquefied, as compared with 15 to 16 per cent with the other systems, the great advantage of the low-pressure expansion turbine system is the low capital costs and small space requirements of the plant.

Present Work

Finally, the difficulties must be emphasised of securing satisfactory and long continued operation of high-speed expansion turbines. While these difficulties may not be regarded as insuperable, they are nevertheless very formidable. It is known that attempts to develop high-speed turbines somewhat along the lines advocated by Kapitza, are being undertaken both in this country and in the U.S.A., but no published information has emerged as yet. Meantime, the large-scale plants under construction or projected in the U.S.A. are designed on the basic Linde outlines.

One fact appears certain: there are very substantial advantages to be obtained by the development of a satisfactory high-speed expansion turbine. Considerable research and development work in this country is required to determine the possibilities of such machines and the important factors in their design and operation.

At present reports from Russia continue to emphasise the important part in industry

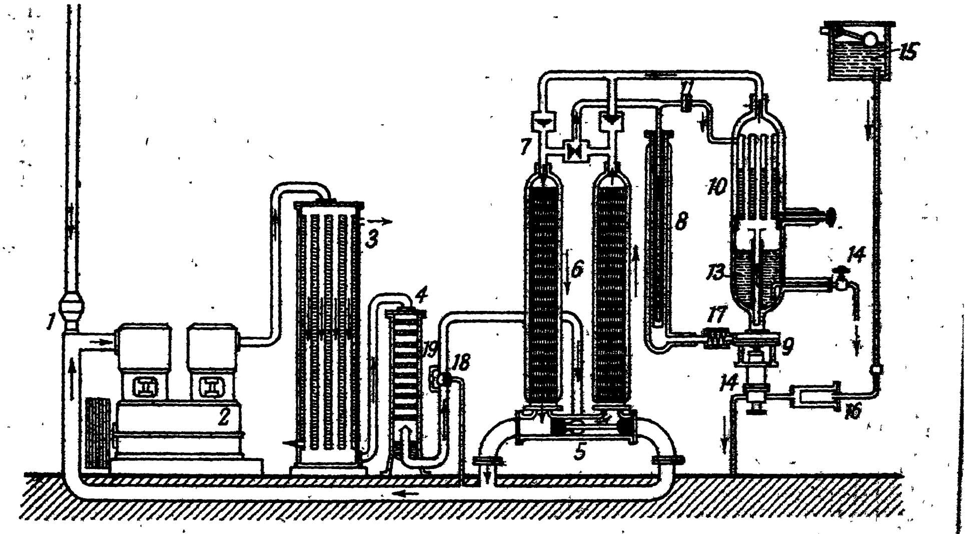


Fig. 8. Plant for liquefaction of air, incorporating high-speed expansion turbine (Kapitza)

being played by oxygen and the great developments planned to extend the field of utilisation. Langmuir[4], in an account of an interview with Kapitza, states that a large-scale plant, estimated to cost 100 million dollars, is now under construction to provide a metallurgical plant comprising blast furnace and Bessemer, together with an auxiliary plant for oxygen manufacture using the Kapitza high-speed expansion turbine.

In this interview Kapitza indicated that overall savings of 25 to 30 per cent could be achieved in the production of pig-iron and steel by utilising oxygen-enriched air. There has been a report of a blast furnace[10] operating with enriched air up to 33 per cent oxygen, which has given 130 per cent increase in output, with a very appreciable saving in coke consumption. Experiments have also been reported on the utilisation of enriched air, up to 40 per cent oxygen, on an open-hearth furnace for steel manufacture[11]. This furnace showed an increase of approximately 50 per cent in the efficiency coefficient of heat utilisation.

Future Developments

There is every indication that very important developments will occur within the next few years in the utilisation of oxygen on a large scale. Reports have appeared[12] of the very large oxygen plant now under construction at Brownsville, Texas, to produce 48,000,000 cu. ft. of 90 per cent oxygen per day. This will be used in the partial oxidation of 68,000,000 cu. ft. of natural gas to yield petrol, diesel oil and alcohols. The cost of the oxygen produced is estimated at 4.8 cents per 1000 cu. ft. At Hamilton, Ont., the Steel Company of Canada have carried out very extensive tests on the application of oxygen to the open-hearth steel furnace and several blast furnaces in the U.S.A. and Canada have been used to test the effect of oxygenated blast on the production of pig-iron. A very novel application of oxygen is planned by the U.S. Bureau of Mines in collaboration with the Alabama Power Company, the aim of this experiment being to gasify coal underground at the Gorgas mine in Alabama.

These are significant pointers to the ways in which oxygen may be utilised on a large scale in the near future. Obviously the cost factor is dominant in all considerations of this kind. While the estimated price of 4.8 cents per 1000 cu. ft. at Brownsville is not likely to obtain generally, it is estimated that oxygen will be manufactured on a large scale at not more than 12 cents (7¼d.) per 1000 cu. ft. Present prices in the U.S.A. for high purity oxygen delivered to consumers in insulated liquid containers run from 3 dollars per 1000 cu. ft. and upward. These figures are in line with those obtaining in this country which run from 12s. 6d. per 1000 cu. ft.

Considerable savings and increased output are possible when the oxygen is produced in the gaseous form at atmospheric pressure. This fact will largely determine the pattern of future plants utilising oxygen on a large scale. To enable the oxygen to be produced at the lowest cost, involving production in the gaseous state, the manufacturing plant must be situated in close proximity to the point of consumption.

Transport of liquid oxygen in insulated containers cannot offer any solution to these problems. The answer lies in the development of integrated plants with oxygen manufacturing units of adequate size included in the basic lay-out. Undoubtedly such schemes will involve very considerable capital outlay. As indicated in the estimated costs worked out previously, a plant with an output of 250,000 cu. ft. of 90 per cent oxygen per hour costs in the neighbourhood of £250,000. Capital cost does not increase in proportion to increase in capacity, a plant producing one million cu. ft. of oxygen costing little more than half a million pounds.

As shown earlier, however, depreciation, interest, repairs and maintenance, represent only about 25 to 35 per cent of the manufacturing costs, when assuming an overall figure of 15 per cent of capital costs to cover these items.

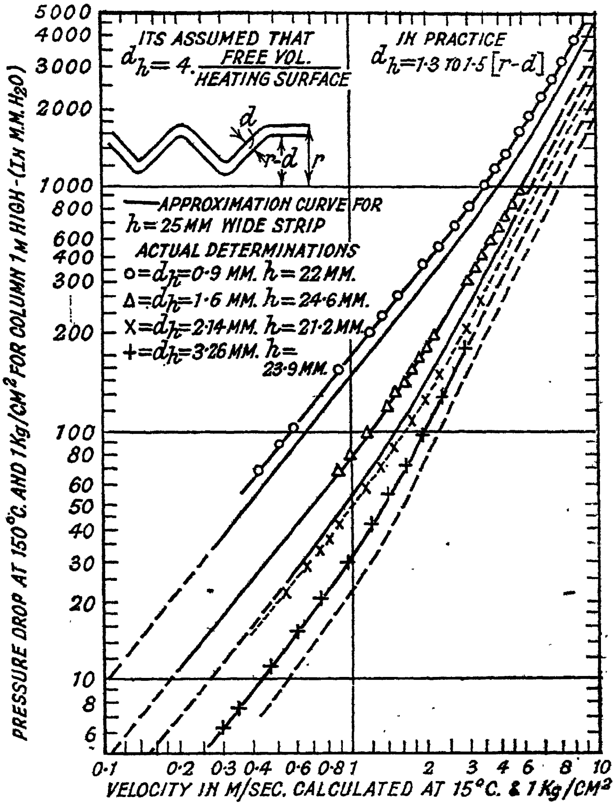
Expensive Electricity

The main item in oxygen manufacturing costs is electric power, accounting for 60 to 70 per cent of the total. Under present conditions the "grid" price of electric power constitutes the biggest problem to any appreciable reduction in the manufacturing costs. A partial solution does exist however in large iron and steel plants where a surplus of blast furnace gas is available. Continental practice has conclusively demonstrated that the employment of blast furnace gas in gas engines represents the most efficient method of utilisation, although necessitating a large capital expenditure.

Few plants of this type are in existence in this country but in one large installation electric power is generated by the blast furnace gas engines at a figure believed to be about one-third to one half of the "grid" price. Any plans of this type must of necessity be long-term but should be given due consideration in assessing the possibilities of oxygen manufacture and utilisation in iron and steel plants. Of all potential large scale consumers of oxygen, the iron and steel industry must take a very high place and great importance attaches to any method of reducing the manufacturing cost of oxygen.

To meet the requirements of other potential oxygen consumers, power is most easily obtained from the national "grid." Reduction in the manufacturing costs of oxygen depends largely on a reduction in the price of electric power. The alternative is the provision of turbo-compressors driven by high-pressure steam turbines, the method which appears to be favoured in some of the projected large-scale plants in the U.S.A. As indicated earlier, approximate costs, based on American estimates, give a figure of 8d. per 1000 cu. ft. of oxygen for steam consumption, compared with about 1s. for electric power. A saving of this magnitude may just enable manufacturing costs to be brought down to about 1s. per 1000 cu. ft.

(*Concluded*)



Graph showing the pressure drop of air flowing through the Frankl exchanger (F.I.A.T. No. 840)

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Rising U.S. Aluminium Figures

ALUMINIUM salts shipped in the United States in 1946 increased about 4 per cent in quantity and 2 per cent in value compared with 1945—states the U.S. Bureau of Mines. Producers of aluminium salts reported the shipment of 679,656 short tons valued at $19,509,481 in 1946 compared with 652,173 tons valued at $19,186,759 in 1945. Shipments of aluminium sulphate, the principal product of the aluminium salts industry, totalled 612,433 tons in 1946 compared with 581,441 tons in 1945, an increase of 5 per cent. Decreases were noted in the production of sodium aluminium sulphate, anhydrous aluminium chloride, and ammonia alum, and increases in the production of potash alum, sodium aluminate, liquid and crystal aluminium chloride.

German Carbon Blacks

Techniques Described in U.S. Report

GERMAN techniques for manufacturing carbon and lamp blacks from enriched gases, anthracene oil, naphthalene and acetylene are described in a report by the Office of Technical Services, U.S. Department of Commerce. A plant at Dortmund claims that anthracene residues yield 66 per cent reinforcing carbon black, suitable for synthetic rubber production. The report, which contains an evaluation of German blacks compared with Continental and United States products, was prepared by investigators for the British Intelligence Objectives Sub-Committee.

Insufficient wartime production of CK3 and CK4, said to be the best reinforcing carbon black products, forced the Germans to extend supplies by making semi-reinforcing carbon and lamp blacks. The reinforcing blacks were derived from anthracene oil and residues, naphthalene, hydrocarbon-enriched carrier gas, acetylene and, on a pilot plant scale, from a mixture of methane and oxygen. The semi-reinforcing types, inferior for rubber but valuable for printing inks, paints, lacquers, photographic and carbon papers, gramophone records and shoe polishes, were made mainly from anthracene residues and crude naphthalene.

Anthracene's Higher Yield

CK3 and CK4 were produced in quantity from anthracene at Dortmund and from naphthalene at Kalscheuren by the Degussa process. The Germans ascribe the higher yield at Dortmund to the fact that anthracene with 3-ring molecules is more aromatic than naphthalene with 2-ring molecules. The investigators felt that the use of air in the Kalscheuren naphthalene process probably accounted for the lower (48 per cent) yield of carbon black.

The Huls plant of I. G. Farbenindustrie produced wet and dry carbon blacks from by-products of acetylene manufacture by electric arc-cracking for compounding with buna S. Further development of the process is said to show considerable promise of high yields of superior blacks.

A pilot plant was under construction at Bentheim to investigate commercial production of carbon black by pressure-exploding a controlled mixture of methane and oxygen. The process, which was to be semi-continuous, consisted of the incomplete combustion of methane. The product, Hiag-Russ, was to be produced from coke oven gas saturated with light hydrocarbon vapours and was expected to compare favourably with American Micronex.

Expansion of B.S.I.R.A.

Six New Laboratories in Kent

SIX new laboratories of the British Scientific Instrument Research Association were opened at Chislehurst, Kent, last week by Mr. John Wilmot (Minister of Supply). The building that has been taken over offers greatly extended facilities in the departments of optics, chemistry and physics and adds three new fields of research—electrical instruments, electronics and mechanics. This expansion of the association's work has been made possible by an increase in the Government's grant last year from £9000 to £40,300.

Acknowledging the great contribution which the association and its chairman (for 13 years), Dr. W. H. Eccles, has made in forwarding industrial research, the Minister remarked: " No sooner does a laboratory decide to follow a particular line of research than it calls for the instruments without which it cannot execute its programme. The association has already contributed greatly to the tools and instruments which have established the good name of British workmanship in the past, and I am sure it will continue to maintain and even improve this reputation in the future."

More U.S. Carbon Black

Sir Harold Kenward, president of the Tyre Manufacturers' Conference, in a statement on the carbon black shortage, said last week that to reduce the amount of carbon black used in making a tyre would be to shorten the life of the tyre. In an effort to bring about an improvement in the supply position, he said, the British tyre industry had sent a special mission to the U.S., where they had succeeded in obtaining a promise of substantially increased supplies of carbon black He added that the improvement would take effect from next month when, provided no crisis occurred, the supply of tyres would steadily increase.

Metal Stocks and Sales

The stock of non-ferrous scrap metals on charge at May 31 amounted to 43,082 tons made up as follows: Muffled S.A.A., 2316 tons; lead and lead alloy, 1002; copper and copper alloy, 15,528; zinc and zinc alloy, 6521; other grades, 17,715. Stocks of copper and copper alloy and other grades are given as: 15,528 and 17,715 respectively. Sales for the two months' period April/May, 1947, amounted to 12,705 tons (approximate value £850,000).

World Representation at the Congress

392 Delegates from 28 Countries

DETAILS of the 392 official delegates of 28 countries among the 2000 members attending the XIth International Congress of Pure and Applied Chemistry show the following distribution, in which France predominates, after the very strong British representation of science, and official organisations: Great Britain, 144; France, 54; Italy, 41; U.S.A., 26; British Commonwealth (Australia, Canada, India, New Zealand, South Africa), 21; Netherlands, 21; Belgium, 18; Denmark, 12; Czechoslovakia, 11; Switzerland, 9; Norway, 7; Eire, 5; Jugoslavia, 5; Sweden, 3; Poland, 3; Hungary, 3; Turkey, 2; Finland, Greece, Rumania, Spain, Argentine, Uruguay and Venezuela, 1 each. The Prime Minister will be a guest and is expected to speak at the gala dinner of the congress at the Dorchester Hotel, London, on Wednesday next, July 23, the day before the congress ends. The names of the official representatives are:

Great Britain

British Association for the Advancement of Science: Dr. J. L. Simonsen; The British Ceramic Society: Mr. H. W. Webb; British Leather Manufacturers Research Association: Messrs. Ernest W. Merry, R. N. Johnson, Robert F. Innes, Ranajit Ghosh, Kenneth G. A. Pankhurst and Miss Mary Dempsey; British National Committee for Chemistry: Mr. F. W. F. Arnaud, Prof. E. C. Dodds, Prof. E. K. Rideal, Prof. C. N. Hinshelwood, Mr. H. V. Potter, Mr. F. Sproxton, Dr. G. M. Bennett, Sir Jack Drummond, Dr. A. E. Dunstan, Dr. E. V. Evans, Mr. C. S. Garland, Prof. W. E. Garner, Mr. A. Harvey, Dr. H. W. Keenan, Dr. D. T. A. Townend, Sir Ian Heilbron, Dr. L. H. Lampitt; British Plastics Federation: Mr. W. Charles Waghorne and Dr. W. E. de B. Diamond; Middlesex Hospital Medical School: Prof. E. C. Dodds; Department of Health for Scotland: Messrs. E. A. Balfour Birse and J. M. Johnston; Department of Scientific and Industrial Research: Drs. A. C. Monkhouse and A. Parker; Imperial Institute: Dr. J. R. Furlong; Institution of Gas Engineers: Messrs. H. Hollings and T. F. E. Rhead; Institution of Mechanical Engineers: Sir Ewart Smith; Institute of Metals: Mr. Stanley Robson; Institution of Mining and Metallurgy: Prof. W. R. Jones; Institute of Physics: Dr. B. P. Dudding and Mr. E. R. Davies; Lister Institute of Preventive Medicine: Drs. W. M. Morgan, M. G. Macfarlane and R. A. Kekwick; Ministry of Health: Dr. H. E. Magee; Medical Research Council: Drs. R. C. Harington, J. Walker and Harold King; National Institute for Research in Dairying: Drs. S. K. Kon and G. W. Scott Blair; Research Association of British Paint, Colour and Varnish Manufacturers: Drs. L. A. Jordan and S. H. Bell, and Messrs. C. A. Klein and P. J. Gay; Pharmaceutical Society of Great Britain: Mrs. J. K. Irvine, Prof. W. H. Linnell, and Messrs. F. W. Adams and C. W. Maplethorpe; Queen's University: Prof. A. R. J. P. Ubbelohde; Research Association of British Rubber Manufacturers: Dr. Scott and Messrs. Dawson and Wake; Rothamsted Experimental Station: Drs. Ogg and E. M. Crowther; Rowett Research Institute: Mr. D. P. Cuthbertson; Royal Society: Sir Ian Heilbron and Prof. C. N. Hinshelwood; Royal Society of Arts: Prof. C. S. Gibson and Major W. H. Cadman; Society of Chemical Industry: Dr. L. H. Lampitt, Messrs. E. B. Anderson, H. W. Cremer, M. B. Donald, F. P. Dunn, J. M. Leonard, A. V. Hussey, E. B. Maxted and S. Robson, and Profs. T. F. Heyes, G. E. Marrian and E. K. Rideal; Society of Public Analysts and other Analytical Chemists: Dr. D. W. Kent-Jones and Messrs. F. W. F. Arnaud and Norman Strafford; Science Museum: Mr. A. Barclay; St. George's Hospital Medical School: Dr. Nicholas H. Martin; Biochemical Society: Drs. Margaret M. Murray, J. H. Bushill and J. H. Birkinshaw; Imperial College of Science and Technology: Profs. H. V. A. Briscoe, Sir Alfred Egerton and Sir Ian Heilbron; Imperial College of Tropical Agriculture: Prof. F. Hardy; University of Cambridge: Profs. A. R. Todd and R. G. W. Norrish; University of Durham: Profs. G. R. Clemo and F. A. Paneth; University of Edinburgh: Prof. J. P. Kendall; University of Glasgow: Prof. J. W. Cook; University of Liverpool: Prof. A. Robertson; University of London: Sir Robert Pickard; Manchester University: Prof. E. L. Hirst; University College, Nottingham: Prof. J. M. Gulland and Mr. D. O. Jordan; University of Reading: Profs. E. A. Guggenheim and H. D. Kay; Sheffield University: Prof. R. D. Haworth; St. Thomas's Hospital Medical School: Prof. J. N. Davidson and Mr. J. Lowndes; University of Bristol: Profs. W. E. Garner, W. Baker and .T Wallace; Institution of Chemical Engineers: Messrs. H. W. Cremer, L. O. Newton, M. B. Donald, F. A. Greene, H. Griffiths, T. Penny; British Chemical Plant Manufacturers' Association: Messrs. W. R. Beswick, Brian N. Reavell, Norman Neville, E. H. T. Hoblyn; Physical Society: Profs. G. I. Finch and J. D. Bernal; Royal Photographic Society of Great Britain: Mr. F. J. Tritton; University of Wales: Mr. C. A. Edwards; Royal Society of Medicine: Sir Maurice Cassidy; Geological Society of London: Drs. A. F. Hallimond and G. W. Himus; Salters' Company: Major H. E. Stebbing and Messrs. E. Jeffery Hicks and S. Vyvian Hicks; Chemical Research Laboratory: Messrs. R. P. Linstead and V. A. Yardley, Drs. D. D. Pratt, W. H. J. Vernon, E. A. Coulson, G. R. Davies, D. V. N. Hardy, J. G. Mitchell, K. W. Pepper, E. F. G. Herington; War Office: Dr. O. H. Wansbrough-Jones; Worshipful Society of Apothecaries of London: Prof. E. C. Dodds and Dr. Roche Lynch.

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Finnish Academy of Sciences : Prof. Gustaf Komppa ; University of Helsinki : Prof. Gustaf Komppa.

France

Académie Nationale de Médecine : Prof. Strohl ; Académie de Pharmacie : Profs. R. Delaby, Janot, Gautier and Raoul ; Association Française de Normalisation : MM. Duval and Dionisi ; Fédération Française des Sociétés de Sciences Naturelles : Profs. Fabre and Fromageot ; Groupement Technique des Corps Gras : MM. Ripert, Sisley, J. P. Wolff, Bierre, Marroc, de Leyssac, Pierron, Salomon, Cusinberche, Jouslin, Philippeaux, Mme. Wolf, Trillaud, G. Wolf, MM. Roger Barras and Gerard Vandhuick ; Groupement Technique de la Parfumerie : MM. H. M. Gattefosse, Lagneau, Sabetay and Samuel ; Institut Français de Caoutchouc : MM. J. Le Bras and Delalande ; Institut de France : Profs. P. Jolibois and L. Hackspill ; Société Chimique de France : Profs. R. Delaby and G. Champetier ; Fédération Nationale des Associations de Chimie de France : Profs. L. Hackspill, G. Dupont, R. Fabre and R. Delaby, and MM. C. Monnet and Bienaimé ; Société de Chimie Industrielle : MM. Robert Bienaimé, Jean Gerard, De Laire, Furet, Bremond and Deschiens ; Groupement Pour l'Analyse and les Essais : MM. Marteret and Effront ; Association des Chimistes de l'Industrie Textile : M. Sack ; Société d'Encouragement pour l'Industrie Nationale : Prof. H. Gault and M. L. Pineau ; Commission Internationale des Industries Agricoles : Dr. A. B. Lindenberg ; l'Ecole Nationale Supérieure des Mines : M Rey.

Greece

The University of Thessaloniki : Prof. Const. Th. Kawassiades.

Holland

Nederlandsche Centrale Organisatie Voor Toegepast-Natuurwetenschappelijk Onderzoek : Prof. Dr. H. R. Kruyt ; Nederlandsche Chemische Vereeniging : Prof. Drs. H. R. Kruyt, C. J. van Nieuwenburg, P. E. Verkade, J. P. Wibaut, H. J. Backer, H. J. C. Tendeloo, J. H. de Boer, W. G. Burgers, Prof. D. J. Coops and Drs. G. L. Voerman and W. P. Jorissen ; University of Amsterdam : Profs. Dr. J. P. Wibaut and Dr. J. J. A. Ketelaar ; University of Groningen : Prof. Drs. H. J. Backer, F. H. L. van Os and J. J. Hermans ; Koninklijk Instituut van Ingenieurs : Dr. Ir. H. Ter Meulen ; Koninklijk Nederlandsche Akademie van Wetenshappen : Prof. Dr. H. R. Kruyt ; Nederlandsche Maatschappij Ter Bevordering Der Pharmacie : Prof. Dr. E. H. Vogelenzang and Mr. D. C. Kok.

Hungary

Hungarian Society for Natural Sciences : Prof. J. Groh ; Pazmany Peter University : Prof. J. Groh ; Magyar Gyogyszoresztudomanyi Tarsasag : MM. Istvan Molnar and Laszlo Erenyo.

Italy

Academia Nazionale dei Lincei : Francesco Giordani ; Istituto Chimico Citta Universitaria- Roma : Prof. V. Caglioti and Drs. G. Sartori, G. Giacomello and A. Malquori ; Istituto Superiore di Sanita : Profs. D. Marotta, Scipione Anselmi, Roberto Intonti, Guilio Milazzo, Francesco Toffoli ; and Drs. Maria Ester Alessandrini and Filomena Novet Nitti ; Instituti di Chimica Farmaceutica della Universita di Modena : Profs. Luigi Musajo, Alberto Spada and Alberto Tavernari, Signora Dina Spada and Ing. Franco Malvezzi ; Societa Italiana delle Scienze-Roma : Profs. Domenico Marotta, Giovanni Battista Bonino and Luigi Rolla ; Societa Chimica Italiana : Profs. Domenico Marotta, Giovanni Battista Bonino, Vincenzo Gaglioti, Livio Cambi, Grancesco Giordani, Mario Giacomo Levi, Giovanni Malquori, Emanuele Oliveri Mandala, Adolfo Quilico, Luigi Rolla and Antonio Nasini ; University of Florence : Profs. Giorgio Piccardi, Clara Bergamini, Giovanni Speroni, Giovanni Mannelli, Danilo Cozzi and Carlo Musante ; University of Genoa : Profs. Luigi Rolla and Luigi Mazza ; University of Pavia : Prof. Pietro Pratesi ; University of Torino : Prof. Antonio Nasini.

Jugoslavia

Croatian Chemical Society : Profs. Dr. K. Balenovic, Dr. H. Ivekovic, Dr. M. Karsulin, Dr. B. Tezak and Dr. R. Podhorsky ; Jugoslav Academy of Sciences and Arts : Prof. Dr. B. Tezak.

Norway

Norsk Kjemisk Selskap : Profs. Dr. Endre Berner, Dr. Ellen Gleditsch, Drs. Haakon Haraldsen, Einar Bergve and Mr. Henry Ingeberg ; Det Norske Videnskaps-Akademi I Oslo : Dr. Endre Berner and Prof. Dr. Bjarne Samdahl.

Poland

Polska Akademia Umiejetn osci : MM. Wojciech Swietoslawski, Osman Achmatowiz and Profs. Tadeusz Urbanski and Wiktor Kemula ; Polish Chemical Society : Profs. Dr. W. Swietoslawski, Dr. O. Ashmatowicz and Dr. T. Urbanski ; University of Warsaw : Prof. Dr. Wojeiech Swietoslawski.

Rumania

Chemical Society of Rumania : Prof. Dr. C. Candea ; Politechnical School of Timisoara : Prof. Dr. C. Candea.

Spain

Real Academía de Ciencias : Prof. D. Antonio Rius Miro.

Sweden

Swedish Royal Academy of Sciences: Profs. George de Hevesy, Arne Tiselius and Arne Fredga ; Societe Royale des Sciences d'Upsala : Prof. Arne Fredga.

Switzerland

Conseil de la Chimie Suisie : Profs. E. Briner, P. Karrer, W. Treadwell, P. Wenger ; Drs. H. Sturm, G. Weder ; University of Geneva : Prof. Paul E. Wenger ; University of Lausanne : Profs. Dr. A. Girardet and Dr. Ch. Haenny ; University of Berne : Prof. Dr. Walter Feitknecht.

Turkey

Faculty of Science, Ankara University : Profs. Dr. Cemil Dikmen and Dr. Adolf G. Parts.

Uruguay

Asociacion de Quimica y Farmacia del Uruguay : Prof. Dr. Jose J. Cerdeiras Alonso ; Universidad de Montevideo : Prof. Dr. Jose J. Cerdeiras Alonso.

U.S.A.

American Ceramic Society : Dr. Alexander Silverman ; American Institute of Chemists : Mr. Walter J. Murphy,

(*Continued on page* 90)

American Chemical Notebook

From Our New York Correspondent

A NEW electronic detector which can safeguard the lives of miners and industrial workers by warning them of the presence of deadly gas it " hears " in the air, was described by Carl E. Crouthamel and Harvey Diehl, of Iowa State College, at a Midwest regional meeting of the American Chemical Society. The device analyses mixtures of two gases by measuring the speed of sound waves that pass through a gas-filled tube and can be attached to a dial which continuously records its measurements, or can set off a signal when the concentration of one of the gases rises above a certain limit. The electronic ear may also prove valuable in some manufacturing processes. Sound for the electronic ear is provided by an audio frequency oscillator which sends waves vibrating at 1000 to 3000 times a second through a brass tube filled with the gas mixture. A sensitive microphone at the opposite end of the tube picks up the sound waves, analyses them, and records the results on a meter, which is marked off in terms of the concentration of one of the gases.

* * *

Carbon black production and sales were in record volumes in the United States in 1946, responding to larger demand from all classes of domestic consumers and for export. Production of 1,244,421,000 lb. represented an 18 per cent increase over the 1945 record, but was below total sales, which expanded 24 per cent over 1945 to 1,269,740,000 lb. As a result, producers' stocks of carbon black declined to 76,288,000 lb. on December 31, 1946, compared with 102,005,000 lb. at the end of 1945. Furnace black production gained 22 per cent over 1945 to 625,312,000 lb. and was greater for the first time than that of contact-type blacks—619,109,000 lb. The average value of carbon black at the plants increased from 4.02c. a lb. in 1945 to 4.82c. in 1946.

* * *

Diallyl phenyl phosphonate, a new plastic material, has been developed by the Victor Chemical Company, Chicago, Illinois. The new substance—" V-Lite "—is a colourless liquid in its monomeric or original form but polymerises to become a transparent, thermosetting, hard and strong resin. Because of its flame-resistant qualities the new plastic may find its widest application as a coating for inflammable decorations or veneers. Discoverer of the new plastic is Dr. Arthur D. Toy.

* * *

In a report made public this week it was revealed that war production sulphuric acid units having a total yearly rated capacity of 991,250 tons of 100 per cent acid have been sold or leased by the War Assets Administration. They originally cost the U.S. Government 11 million dollars.

* * *

A new occupational disease, termed " delayed chemical pneumonitis," traceable to compounds of beryllium, one of the metals used in the manufacture of atomic bombs, was reported to the National Tuberculosis Association in San Francisco by Dr. Harriet L. Hardy, of the Massachusetts Department of Labour and Industries. The ailment began to be noticed about five years ago when industry found increasing use for beryllium which is extensively used in atom-smashing research and in making alloys with copper or aluminium. Dr. Hardy reported on 36 cases which occurred among workers engaged in the manufacture of fluorescent lamps from one month to four years after exposure to the compound. The patients, she said, suffered serious loss of weight and appetite, had long sieges of coughs and experienced great difficulty in breathing. Of the 36 cases, said Dr. Hardy, twelve were completely disabled, eleven partially disabled, three recovered and four showed no disease symptoms.

* * *

Plans for new plants in which synthetic substitutes for natural chicle will be made are being studied by the Barrett Division of Allied Chemical and Dye Corporation, because present facilities are inadequate to meet the large and growing demand for synthetics used in chewing gum. The substitute material—development of which is causing considerable concern in the tropical states of Chiapas, Campeche, and Quintana Roo in Mexico, where 90 per cent of the world's crop of chicle is collected—is a coal tar coumarone-indene-resin, which is now being produced at the Frankford, Pennsylvania, plant. Several other companies are also supplying the chewing gum industry with synthetics, including a petroleum resin.

* * *

Dr. Ernest O. Lawrence, Nobel prize winner and inventor of the atom-smashing cyclotron, and now at work at the University of California, announces that atoms of three additional elements—lead, bismuth and thalium—have been split by American physicists. " The splitting of these atoms," he said, " at present is only of scientific interest. It will teach us something about the nucleus of the atom but is not of practical application in making atomic bombs." The elements for which atomic fission has been achieved in the present work, are much lighter than those hitherto used.

"SHELL" TRANSPORT AND TRADING

Chemical Developments

IN the course of his annual statement, Sir Frederick Godber, chairman of the "Shell" Transport and Trading Company, Ltd., states that the chemical interests of the group have made notable progress during the year and the fruits of research have permitted further advances in the production of various chemicals from oil.

Shell Chemical Corporation's production of ammonia and ammonium sulphate in California has been extended, and further expansion is under consideration to meet the demand created by the world shortage of fertilisers. The Shell process of nitrojection, in which the ammonia is fed direct into the soil, has attracted much attention, and opened new prospects for territories not artificially irrigated. The new soil fumigant, D.D., is also full of promise for agricultural crops damaged by nematodes.

In Houston, Texas, a new plant for the production of epichlorhydrin has commenced operations and attracted considerable interest in technical circles in the United States. Other facilities completed during the year include units for the manufacture of solvents used in the manufacture of surface coatings, plastics and various other industrial materials.

New Ventures

There have also been some entirely new projects, including the construction of a large synthetic glycerine plant, using a process developed in Shell Development Company's research laboratories and a plant for the manufacture of synthetic ethyl alcohol. After careful examination of the problems and consultation with the Government and other appropriate experts, the group has now decided to embark upon the production of a range of synthetic chemicals, and a new plant in the United Kingdom for this purpose is well on the way to completion at Thornton in Cheshire.

In addition, plans are afoot to extend the company's facilities for manufacturing insecticides, fungicides and other products for use in agriculture.

The Shell synthetic soap plant, which was the first of its kind to be erected in this country, has been doubled in capacity and an entirely new plant is being built, so that the group's total production of these detergents in the United Kingdom will shortly amount to some 50,000 tons per annum. Sir Frederick says that there is no necessity for him to elaborate on the importance of this contribution in minimising to some extent the acute shortage of soap now prevailing.

All these chemicals are manufactured from petroleum and are of service to many industries, agriculture, paints, plastics, textiles and rubber, and as intermediates in the manufacture of still further important chemical products. Certain of them have not hitherto been manufactured in this country, and the production from the group's new plants will therefore form the basis of a new export trade for Great Britain.

In Holland it is intended to erect a synthetic soap plant which will operate mostly on the raw material derived from crude oil produced in Holland, but partly from imports from the Netherlands West Indies.

Research

With regard to research, Sir Frederick says that the group has always been imbued with the fundamental importance of research, and he hopes the shareholders will support the board's decision to make available large resources for these activities. The group's growing chemical interests in this country are based upon work done in the research centres at Thornton, near Stanlow, in Cheshire, at Amsterdam and at that of Shell Development Company at Emeryville, in California.

OLYMPIA EXHIBITORS

Among the firms to be represented at the Engineering and Marine Exhibition at Olympia from August 28 to September 13, are:—

The Metallizing Equipment Company (Stand 13, Row K, ground floor) who will exhibit machinery reclamation and anti-corrosive coatings; and Murex Welding Processes (Stand 11, Row E Welding Exhibition), who will be exhibiting a wide range of welding plant and equipment of the latest design.

(*Continued from p. 88*)

Colonel Marston T. Bogert, Drs. Gustav Egloff, M. L. Crossley and Foster Dee Snell; National Academy of Sciences: Profs. Marston T. Bogert and W. Albert Noyes and Dr. Linus Pauling; National Research Council: Profs. Marston T. Bogert, H. F. Mark, W. A. Noyes, Linus Pauling, Alexander Silverman, Robert E. Swain, I. M. Kolthoff, Drs. Edgar Reynolds Smith, Edward Wichers, Francis J. Curtis, Walter R. Kirner, Maj.-Gen. Alden H. Waitt, Messrs. J. W. Perry, Alden H. Emery, Robert C. Swain and Foster D. Snell, W. J. Murphy; Columbia University in the City of New York: Prof. Marston T. Bogert; The University of Pittsburgh: Dr. Alexander Silverman; University of Minnesota: Prof. Dr. Izaak M. Kolthoff.

Venezuela

Sociedad Venezolana de Ciencias Naturales: Prof. Dr. Humberto Garcia Arocha.

CREATING WORLD CHEMICAL STANDARDS

Aims of Current Meetings of the International Union

THE 48-year-old International Union of Chemistry, whose meeting in London this week and next under the presidency of Lord Leverhulme immediately followed the centenary celebrations of the Chemical Society, is dealing with a full agenda of important work of definition. This relates to atomic weights, physico-chemical standards, chemical symbols and nomenclature, tables of physical, radio-active and other constants, supplies or stockpiles of chemicals of guaranteed purity, including rare chemicals, and much other similar work of profound interest to chemists and chemical manufacturers the world over. The Union now works integrally with the International Congress of Pure and Applied Chemistry.

Wide Objectives

In view of the supreme importance of having generally agreed standards of nomenclature and constants of world-wide currency in chemical science and industry, and the rapid advances which are being made in all branches, the need for the widest possible support of the Union by the nations is self evident. The greater the support received and the stronger its financial position, the more effectively will the Union carry out work which closely and deeply concerns every chemist and physicist, and the whole vast and varied realm of chemical industry. The Union's permanent official headquarters are at present in Paris, and, in general terms, the main purpose of the Union is to ensure continuous co-operation between chemists of member nations, to co-ordinate their scientific and technical activities, and contribute to the general advance of chemistry and of the many industries based on it.

The many problems with which it is engaged have been assigned to various commissions, some of whose reports are now being presented, supplying a basis of decisions being taken in London. Other business includes: the election of officers for the quadrennium 1947-51, the choice of country to act as host for the fifteenth conference in 1949, the increasingly difficult matter of documentation and abstracting, the question of closer affiliation with UNESCO, and the supply of new and up-to-date chemical encyclopædias or compendia of the Beilstein or Ullmann type—work of urgent necessity which was seriously impeded and prejudiced by the war.

Conflicting Nomenclature

The commission dealing with uniformity of nomenclature had a difficult task, in view of the many new elements discovered in recent years, such as technetium (43), astatine (85), francium (87), neptunium (93), americium (95), and curium (96). Some of these have been given other names, such as masurium (43), alabamine (85), and virginium (87) by other investigators.

There is also confusion in symbols: both Fr and Fa have been used for francium, and Fr has also been used for florentium (61) which is another name for illinium (61). Moreover, the element (41) is sometimes known as columbium and sometimes as niobium. The comparatively well known beryllium is also known as glucinum. In Dr. Sherwood Taylor's "Inorganic Chemistry" (8th edit. 1946) is given a complete list of names and atomic weights as established in 1941 (pp.172-3), omitting two or three of the new ones mentioned.

Tables of atomic weights have been issued annually since 1931, and the commission working on these tables, under the presidency of Prof. Baxter, of Harvard University, completed its report a few months ago. This is the 13th Atomic Weight Report.

Physico-Chemical Standards

Another commission is dealing with physico-chemical standards, having Wojciech Swietoslawski, Warsaw, as president, and working in close liaison with the International Bureau of Physico-Chemical Standards established some years ago in Brussels, with Jean Timmermanns as director. Its purpose was to prepare and supply chemicals of standard purity.

It will be recalled that a UNESCO report included a reference to the supply of pure chemical compounds; and the matter has recently been under discussion between Dr. Needham, of UNESCO, and Dr. Timmermanns. The subject is being further considered at the present sessions in connection with the establishment of international research laboratories and observatories.

There may be three categories of chemicals concerned: (a) comparatively rare and not readily available, of which a collection is already being made by the Armour Research Foundation, Chicago, and by the U.S. National Research Council; (b) those well known in chemical industry, as hitherto supplied by the Timmermann laboratory and by some firms in this country; and (c) chemicals of a specially high standard of purity required for special research or metrological work where extreme quantitative accuracy is essential. (By way of example of these latter, may be mentioned water, not usually regarded as a chemical but yet one of the most important. To obtain perfectly pure water is a difficult and complicated business, requiring much more than mere distillation.)

The Union is considering the establishment, preferably in co-operation with the Armour Research Foundation and other like bodies, of a central stock-pile of these three classes of chemicals, with headquarters, say, in Brussels, and branches in different parts of the world, on similar lines to the chain of micro-biological type culture collections already in existence.

Supply of Encyclopædias

Another matter of equal interest and importance is the compilation and supply of encyclopædic compendia and handbooks, such as Beilstein, which are indispensable to the organic chemist. It is understood that the re-issue of Beilstein has been started in Germany; but the question has been raised whether these encyclopædic works, including others like Gmelin, Ullmann, Abegg, etc., should not be subdivided into separate works. Other problems include the simplification of symbols, which Dr. Dyson has studied so thoroughly for many years, and for which he has lately proposed a new system.

These are some of the bases of the discussions which the Union initiated on Thursday, but recognition must also be given to the strong links of interest and friendship between nations that can be forged by these scientific re-unions dealing with fundamental issues of common concern to all. On this ground, therefore, as well as on the practical ground of efficient achievement of the Union's aims, it is to be earnestly wished that a measure of international collaboration in strengthening the foundations of chemical science and industry and on more general ground will be the outcome of the current meetings.

New-Type Hydraulic Power Pump

Demonstration at Caxton Hall

THERE was a large gathering of trade and technical Press representatives in the Kent Room, Caxton Hall, last week, when Oswalds & Ridgway, Ltd., demonstrated an entirely new type of hydraulic power pump, the invention of Mr. T. E. Beacham. Developing pressures up to and in excess of 3 tons per sq. in., the pump is suitable for the operation of self-contained presses, testing machines, injection moulding machines, etc.

An outstanding feature is the use of the swashplate (or conic crank) mechanism with its advantage of compactness over the often more popular parallel crank. The mechanism contains neither connecting rods, slipper, nor universal joints, the reciprocation of the plungers being obtained by direct contact between them and a single swashplate.

Possessing dynamic balance and freedom from vibration, it is claimed that it is generally unnecessary to bolt the pump to a rigid foundation. The vertical arrangement shown is considered preferable, but a horizontal layout is available for locations where a low overall height is essential. Both arrangements include filters and relief valves; in the case of the horizontal layout a reversing control valve is mounted on the side of the tank.

The manufacturers point out that while the mechanism has been particularly adapted for the purposes described above, it may well carry advantages for use with hydraulic motors, small air compressors, and refrigerating machines.

Pump and tank unit with vertical motor

POWDER METALLURGY

Progress in Great Britain Reviewed

THE interest and importance of metal powders and their products have again been emphasised by a symposium of papers published by the Iron and Steel Institute as Special Report No. 38 (1947), and forming the subject of discussion at a meeting held at the Institution of Civil Engineers on June 18-19. The papers were contributed by leading research workers in this field in this country, and at the meeting were present, by invitation of the I.S.I., representatives of the Institute of Metals, the Institutions of Mechanical Engineers, Electrical Engineers, Production Engineers and Automobile Engineers, and the Society of Chemical Industry. The papers and the discussions revealed that some progress had been made in practically all branches of powder metallurgy, particuarly during the war years when the application of the new methods and products was more than ever realised and appreciated.

Historical Bases

Dr. W. D. Jones in his brief introductory historical note showed that some of the basic principles date back at least as far as 1800 in the remarkable work of Wollaston, of Johnson, Matthey & Co., Ltd., in the production of malleable platinum from the powdered metal. Sir Henry Bessemer later started the manufacture of brass powder for bronze paints in 1843. Dr. Jones was of the opinion that in recent times no fundamental contribution or invention has been made in powder metallurgy by British workers since Wollaston and Bessemer; and he is not aware of any outstanding contributions of a theoretical nature made in this country before 1939, although notable advances in closely related subjects must be credited to Beilby, Tomlinson, Hardy and others on adhesion, and to Bowden and co-workers on friction processes.

It seemed that we had lagged seriously behind the U.S.A. and Germany; but from the three papers in the symposium on developments in Germany it appeared that we have now caught up so far as that country is concerned, although still much behind America on a tonnage basis. During and since the war valuable British work has been accomplished, much of it unpublished, and at present, in addition to the comparatively few pioneer firms who have long been in the field, there are probably 50 others in Britain who are investigating commercial possibilities.

Many papers on the preparation, etc., of metal powders and products were given. Iron powders naturally occupied the principal place in the symposium, and much of Section B was devoted to their preparation, properties and test, in two valuable papers based on work in the Armament Research Department, Woolwich. Pilot plant scale production of electrolytic iron powder was described, using a 10 per cent ferrous ammonium sulphate solution at 35° C., pH 2.5, and c.d. of 200 amp./sq. ft., half the current being fed through iron anodes and half through lead anodes in porous pots. A rough estimate of cost for one ton per week was 1s. to 1s. 4d. per lb. Electrolytic reduction of ferrous hydroxide and electrodeposition followed by grinding of brittle flake formed the subject of some preliminary tests. Annealing in hydrogen proved advantageous in the first method.

Electrolytic or Oxide Reduction

The other paper from Woolwich, described the properties of 28 commercial iron powders and compacts from them, generally obtained by the electrolytic or oxide reduction method, but including also some carbonyl, abrasion, and chloride reduction powders. Much attention was devoted to methods of test and standardising tests, such as the various densities, flow behaviour, particle data, crystal structure and surface texture, as well as oxygen, hydrogen, and nitrogen content. The electrolytic iron powders were, in general, purer, softer in the annealed condition, and had slightly greater compressibility, than the oxide-reduced type, though both types varied widely.

The paper from the Murex laboratories, among the leading pioneers in powder metallurgy in this country, described briefly the various processes of metal powder production: milling, machining, atomising, granulating or shotting, graining, oxide reduction, salt reduction, electrolysis, carbonyl process, hydride process, miscellaneous; with some or all of which there may be variations. Production methods and principal characteristics of some metal powders were tabulated, including Al, Be, brass, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, Ta, Sn, TiH, W, and Zn.

The properties of flake and granular powders—aluminium, copper, bronze—were compared in another paper, which described their production using either the stamp or modified ball mill. These powders are of considerable interest to the paint industry because of their covering and leafing powers and lustre; and are used, too, in lightweight concrete, and in pyrotechnics. Risk of dust explosion in the stamping process, especially with aluminium, is considerable, and is removed by use of an inert atmosphere.

Electrical and radio engineers and physicists found much of interest in Section C on magnetic powders and products.

Single and Complex Carbides

Another very important and interesting field of powder metallurgy, it was indicated, was to be found in the hard metal carbides (Section D) in which three papers gave practical details of production, etc., and a fourth (Drs. Sandford and Trent, of Hard Metal Tools, Ltd.) described some of the underlying principles and phenomena in the physical metallurgy of these carbides. This last was of both theoretical and practical interest. It dealt with the physical and chemical changes during sintering, of which the course was followed by microscopical determination of contraction. The principal carbides used in British industry today are WC, TiC and TaC. Complex carbides embodying VC and/or Mo_2C have been tried, and niobium carbide (NbC) has also been prepared. Methods for production of single carbides were given as direct carburisation of the metal powder, combined reduction of oxide and carburisation of metal, carburisation of alloy containing metal followed by chemical separation; and for the double carbides: heating a mixture of individual carbides, heating a mixture of oxide, carbide, and carbon, or heating a mixture of two oxides and carbon.

Dr. Sandford stated that the patent literature shows that claims have been made for use of nearly all the hard carbides, singly or in combination but that most of these have had no commercial success. Present day industrial alloys, therefore, comprised three groups: (1) tungsten carbide and cobalt, (2) tungsten and titanium carbides and cobalt, (3) tungsten, titanium, and tantalum carbides and cobalt.

The paper on the German hard metal industry included results of German researches into the structure and physical properties of hard metals and their constituents, and some account of diamond-hard metal formed from tungsten carbide and diamond powder.

OFFICIAL NOTICES

Non-Ferrous Metals

NEW prices for non-ferrous scrap metal and a reduction of £5 per ton for electrolytic copper are the subjects of Press statements by the Ministry of Supply this week. By an order (Control of Non-Ferrous Metals (No. 29) (Copper, Lead and Zinc Order, 1947), with effect from July 14, the maximum price for high conductivity electrolytic copper is reduced by £5 per ton from £137 to £132 per ton delivered. Prices for other descriptions of copper are correspondingly adjusted except in the case of black hot-rolled copper wire rods, where the new price is £138 per ton against £142 and where the margin over the copper price is now £6 per ton in place of £5. The reduction in the copper price reflects the lower price at which the Ministry is now buying copper overseas.

The premiums on a variety of copper shapes are increased by varying amounts of between 15s. and £1 10s. per ton to bring them more into line with the Ministry's costs. Some shapes not hitherto covered by order are also listed. The order also authorises the performance of pre-order contracts at the old prices. The Directorate of Non-Ferrous Metals, 20 Albert Street, Rugby, is dealing with all inquiries about the new conditions and copies of the order are obtainable from H.M. Stationery Office (1d.).

The Ministry announces also the withdrawal of the restriction whereby the issue of licences for copper, zinc and tin metal, as supplied by the Directorate of Non-Ferrous Metals, was limited in accordance with the applicant's rate of consumption, stock and forward purchases.

Thus, applicants for licences (and contracts) for these metals will in future need to give only the one guarantee that their application is against orders for their products, full allowance having been made for their intake of scrap.

Scrap Metal

The new prices of non-ferrous metallic scrap have immediate effect and will continue in force until the end of October.

Chemicals for Export

The Board of Trade announces that the following chemicals have now been released from export licensing control: Ethyl silicate, parachlor-nitrobenzene, and paranitrophenol.

Du Pont's New Export.—The Du Pont Company has announced that its new motor body finish, "Duco" metalli-chrome nitrocellulose lacquer, is now available for overseas distribution. Up to now the shortage of raw materials and other production problems have made it impossible to accept orders for shipment outside the United States.

Technical Publications

A TIMELY publication in view of the widening uses of glycols and the present demand is the booklet "Glycols" being distributed in this country by the Carbide and Carbon Chemicals Corp. of New York. It presents in detail the properties, specifications, and uses of ethylene glycol, diethylene glycol, "Kromfax" solvent (thiodiglycol), triethylene glycol, propylene glycol, dipropylene glycol, and ethylhexanediol. It gives in 30 charts such information as physical constants, comparative evaporation rates, and solubility data and gives references of 94 technical publications dealing with glycols.

* * *

Investigations by the U.S. Bureau of Mines into mineral deposits in the western and south-western sections of the United States are described in four separate publications just released. They are: Report of Investigations 3972: "Exploration of Alunite Deposits, Marysvale, Piute County, Utah"; 3954: "Exploration of the Crowell Fluorspar Mine, Nye County, Nevada"; 3973: "Exploration of the Queen Mary Copper Project, Missoula County, Mont."; 3971: "Exploration of Barite Deposits in Montgomery County, Ark."

* * *

The U.S. Bureau of Mines publishes Report of Investigations R.I. 4071 on "Beneficiation of Beryllium Ores." Procedures have been developed for preparing commercial-grade concentrates of beryl from pegmatite ores, ranging in grade from 0.94 per cent BeO to 0.08 per cent BeO. Almost complete separation of beryl from the common pegmatite minerals, quartz, feldspar, and muscovite, as well as the less common mineral apatite, was readily accomplished by flotation; separation of the lithium minerals from beryl achieved some success.

* * *

The U.S. Bureau of Mines has also released two separate publications on iron deposits in Washington and Texas as follows: Report on Investigations 4051: "Iron Deposits of Buckhorn Mountain, Meyers Creek Mining District, Okanogan County, Wash."; and Report of Investigations 4045, "Central Texas (Llano) Iron Deposits, Llano and Mason Counties, Tex."

* * *

The history and physical properties of "Gammexane" insecticide (based on the Gamma isomer of benzene hexachloride) is dealt with at some length in the new "Agrocide" booklet issued by Plant Protection, Ltd.

* * *

The results of intensive research in rubber technology by the Dyestuffs Division of Imperial Chemical Industries, Ltd., on behalf of the Ministry of Supply and the Admiralty are set out in the new publications, "Identification and Investigation of Natural and Synthetic Rubbers" and "A Study of Accelerated Ageing Tests." Inquiries about these are being dealt with by the Ministry of Supply, Advisory Service on Rubber, Shell-Mex House, Strand, London, W.C.2.

Welding Research Reports

THE first (April) issue of *Welding Research*, the new official organ of the British Welding Research Association, contains interesting reports on the strength of spot welds in M.S. sheet, and on welded stanchion joints. This work was carried out at the association's research station at Abington Hall, near Cambridge.

Fatigue Loading Conditions

In the May issue the association reports on "Recommendations for the Heat Treatment of Welded Construction in Mild Steel," a description of preliminary development work on the behaviour of welded constructions under fatigue loading conditions. Although considerable attention has been paid to the subject in other countries, the work has centred mainly on the determination of fatigue strength of welded joints rather than complete structures. Some investigations, however, have been carried out in Germany and America where experience has shown that testing installations require to be substantial in size and capacity, and therefore correspondingly expensive. In the absence of such equipment, and in view of the impracticability of obtaining it, the B.W.R.A. has adopted the resonance vibration method. The report goes on to describe how four testing units have now been installed and have been found to work satisfactorily. A programme of long-term fundamental investigation is now in hand, together with a short range series of tests on constructional details of stiffened plate applicable to shipbuilding.

Heat Treatment

Another report in the same issue is entitled "Fatigue Tests by the Resonance Vibration Method on 4 Welded H-beams"; it deals with the heat treatment of welded construcions. The recommendaions put forward are based on present knowledge and experience, but it is stressed that upon completion of the present study, experimental work might well be initiated with the object of dealing in particular with the problems of local heat treatment.

Home News Items

Damar Gum. — The Board of Trade announces that, as from July 16, gum damar consigned from any country may be imported without individual import licences.

Reduced Overseas Telephone Rates.—Reduced rates now apply to telephone calls during the 24 hours on Sundays on the services with Canada, United States of America, Cuba, and Mexico.

Ice Plant for Sunderland. — The purpose of a bill which passed the committee stage in the House of Commons last week is to empower the Sunderland Corporation to construct and operate an ice factory. Supplies are at present obtained from neighbouring centres.

Shale Miners. — Shale miners in Scotland have given a lead to workers in all other industries by producing more in their new 5½-day week than in the old 6-day week, says Mr. Walter Nellies, their union secretary. He adds that he is confident that the results of the first month of the new system will be maintained.

Winter Power Prospects.—The possibility that electricity undertakings would collectively face a demand this winter for some two million kilowatts above their capacity was admitted by Sir Guy Nott-Bower, deputy secretary of the Ministry of Fuel at a Press conference in London last week. In spite of the fuel economy campaign, consumption of electricity and gas was still at a higher rate than last year.

Fire at Chemical Factory.—About 100 bags of quilla bark, which provides a chemical used in the preparation of foam fire-extinguishers, were damaged by a fire which broke out on the premises of Messrs. C. W. Field, Ltd., manufacturing chemists, Speke, Liverpool, on July 4. The City Fire Service quelled the fire, which was confined to stock in a building separated from the main factory.

New Publications.—Newly issued commercial publications on technical subjects just issued include a 20 pp. description, fully illustrated, of a number of steel cutters for a variety of purposes now made available by Protolite, Ltd., employing highly resistant "cemented carbide"; and an extremely well produced "book" describing the development and activities of B. Laporte, Ltd., the Luton chemical manufacturers. The latter provides, in addition to a very full review of manufactures and services, an interesting account of the firm's history since its inception, as a manufacturer of hydrogen peroxide, in 1888.

Works Holiday. — Messrs. Howards & Sons, Ltd., of Ilford, advise that production will be suspended at their works from July 26 to August 5, inclusive, to cover the duration of the annual holiday.

Visit to Steelworks.—Eighty members of the N. London Branch of the Institute of Welding recently were enabled to watch all the processes of steel casting at the Letchworth works of Kryn & Layh Steelfounders & Engineers, Ltd., by the courtesy of the management.

Cost of Texas Disaster.—The cost to London underwriters of insurance claims in respect of the fire and explosions at Texas City and the Monsanto Chemical Works in May is now estimated to be not less than £5 million. First American reports estimated the total insurance liability would be £12 million.

Steel and Timber Shortage.—Speaking at the annual general meeting of Harland & Wolff at Belfast on June 26, Sir Frederick E. Rebbeck, the chairman, said that the steel and timber situation was serious, and was causing delay in all directions. He deplored the decision to exclude steel for shipbuilding from the priority list, and hoped that the matter would receive early reconsideration.

Medals for Chemistry. — A prize in chemistry to commemorate the semi-jubilee of Sir James C. Irvine as principal of St. Andrews University is to be established with funds contributed by present and former students. The prize will consist of two silver medals to be awarded annually to the best students in chemistry in the United College, St. Andrews, and in University College, Dundee.

Home Enterprise in Quebec. — Durham Chemicals, Birtley, are associated with Messrs. Harrisons & Crossfield in opening a chemical manufacturing plant at Quebec, Canada. The new plant is expected to be in production within a few months and will make materials for the rubber, paint, paper and textile industries. The whole of the technical side of production will, it is understood, be controlled from Birtley.

Linseed Oil Substitute?—The prospect of a source of linseed oil substitute is held out by preliminary reports on research in Prof. Hilditch's laboratory at Liverpool University upon heat treated seeds of a West African vine. Nigeria is to send a large quantity of the seeds for research and technical trials, and the Paint Research Department of the L.M.S. Railway are also carrying out an investigation of the new material.

Personal

Mr. H. C. Mallett has been elected a director of Associated Clay Industries.

Dr. R. Long has been appointed to Birmingham University as lecturer in chemical engineering.

Dr. F. Smith, of Birmingham University, has accepted the chair of chemistry at the University of Minnesota.

Mr. T. T. Cocking, chief analyst of British Drug Houses, Ltd., retired on June 30 after a 43-year period of service.

Mr. H. W. Pasteur and Mr. A. Greenfield have been appointed to the board of J. & E. Hall, Ltd.

Mr. R. W. Foot has been appointed a director of British Tar Products in succession to Mr. G. A. Longden, who has resigned.

Dr. W. B. Hawes, former chief engineer to the Wellcome Foundation, Ltd., has now become production director to A.S.P. Chemical Co., Ltd.

Dr. B. Edgington has been appointed chief chemical engineer to Boots Pure Drug Co., Ltd., in succession to Mr. H. Calam, who has retired.

Dr. T. G. Hunter, a member of Birmingham University engineering staff, has been appointed to the chair of chemical engineering at Sydney University.

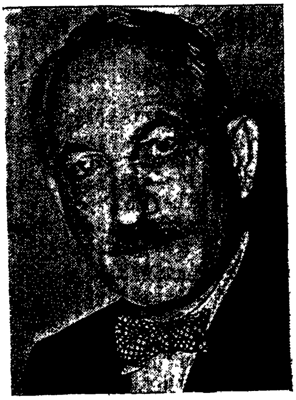
Professor W. F. K. Wynne-Jones, professor of chemistry at University College, Dundee, has been appointed professor of physical chemistry at King's College, Durham.

Messrs. W. N. Hall, M. W. McCutcheon, M. Wood and A. Miller are newly-appointed directors of the Canadian Standard Chemical Co., Ltd., the company having decided to increase the board of directors from eight to twelve.

Mr. S. P. Chambers, a member of the Board of Inland Revenue, and until recently chief of the finance division of the Control Commission for Germany, has retired from public service to become a director of Imperial Chemical Industries.

Dr. F. J. Llewellyn, of the chemistry department of Birmingham University, has been appointed to the chair of chemistry at Auckland (N.Z.) University College, where he succeeds Professor F. P. Worley. Only 31, Dr. Llewellyn has been lecturer in general and crystal chemistry and senior foundation Imperial Chemical Industries' Research Fellow at Birmingham University since 1945.

"Classification Systems in Relation to the Special Library," by Mr. D. V. Arnold (Paints Division, I.C.I., Ltd.), and "Preparation and Use of Bibliographies in the Special Library," by Mr. L. Patrick (British Non-Ferrous Metals Research Association) are among principal items on the agenda of the meetings in London from August 11 to 16 of the 1947 Study Group of the Association of Special Librarians and Information Bureaux.



Prof. Selman Waksman, inventor of the new drug streptomycin, who is on a visit to this country

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Obituary

Professor A. W. Stewart, professor of chemistry at Queen's University, Belfast, died on July 2. He graduated at Glasgow University—of which his father the late Professor W. Stewart was Dean of Faculties—before proceeding to Marburg University. His appointments were: assistant to Sir William Ramsay at University College, London (1905); lecturer in organic chemistry at Queen's, Belfast (1909); lecturer in physical chemistry and radio-activity, Glasgow (1914); professor of chemistry at Queen's, Belfast (1919).

Foreign Capital for Brazil

The Brazilian Government is considering the question of employing foreign capital in the development of Brazil's natural resources, especially the participation of U.S. capital in the expansion of the oil industry; it is reported that a Bill to regulate the production, refining and distribution of petroleum is now being prepared. The oil industry of Brazil is at present controlled by the Conselho Nacional de Petroleo, and the activities of that Government Department have been largely confined to the State of Bahia. An American oil expert is reported to have stated that, whilst no extensive oilfield has yet been found in Brazil, the prospects are encouraging.

Overseas News Items

Uranium Find in Arizona.—Discovery of a large deposit of uranium-bearing ore in a deposit of carnotite has been announced by the Arizona Department of Mineral Resources. Preliminary assays show an unusually high uranium content of 1.5 per cent.

U.S. Coal £5 Ton.—American coal, of which 100,000 tons of a possible 600,000 tons allocation are expected to arrive in South Wales this month, will cost about £5 per ton delivered. The f.o.b. cost is stated to be 45s. to 50s. per ton, added to which will be freight charges of 50s. per ton.

Czech Oil Production.—New products with the properties of linseed-oil and of Chinese wool-oil will soon be processed in the Lovosice Works of the Czechoslovak Fat Factories. Castor oil-beans from South-America will be used to provide raw material for the paint, varnish, textile and leather industries.

Canadian Caustic and Chlorine Plant.—Erection of a caustic soda and chlorine plant at Beauharnois, Quebec, at an estimated cost of $4,300,000 is part of a $6,300,000 expansion programme of the Dominion Tar & Chemical Co. The plant will be erected by Dominion Alkali & Chemical Co., a new wholly-owned subsidiary now being organised. The plant will have an approximate rated capacity of 60 short tons of chlorine, 67½ short tons of caustic soda, and 1¾ short tons of hydrogen.

German Radio-active Ores.—It is reported that radium-containing ores are being mined in Germany on an increased scale near Oberschlema, a spa famous for its medicinal waters. Prospecting for radium ores is also said to be in progress at Schneeberg and Marienberg. The work is in the hands of Vitriolwerke A.G., and workers in Thuringia and Saxony are said to have been sent to these localities on compulsory service, while visitors from outside are not allowed to enter them.

Chemicals Production in Berlin. — The Pfeilring-Works in Berlin, formerly Jaffe & Darmstaedter, were once well known for their lanolin, a fat product obtained from raw wool. One of their two plants is now almost completely restored and the other will be in operation before the end of the year. The firm manufactures chemical and technical household goods, soaps and polishes. Last month the firm produced 80,000 soap tablets, 100,000 pieces of shaving soap, 150,000 packets of protective cream, about 100,000 jars of cold cream and 50,000 tins of shoe polish.

Hungarian Bank Acquires Kodak Factory.—The Hungarian General Credit Bank has acquired the Kodak Factory at Vac, near Budapest, and production will soon be resumed under the new name Photo-Chemical Industry Company.

Copper Futures Again in New York.—For the first time in six years, trading in copper futures will be resumed this month on the New York Commodity Exchange, which will thus become the only " free " copper market since free trading was discontinued soon after the outbreak of war.

Electrodes from Eastern Germany.—A firm for the manufacture of superarc-electrodes has recently been founded by the Wölcke GmbH at Böhlitz, near Leipzig. In addition to covering filler metals belonging to other firms, it will soon take up the manufacture of dipped electrodes and pressed electrodes.

Hanover Trade Fair.—The first export trade fair for the display of goods produced in the joint U.S./U.K. zones of occupation in Germany will be held in the Vereinigte Leichmetall Werke factory at Laatzen from August 18 to September 7. Pharmaceuticals, chemicals and dyestuffs will be included among the exhibits.

Chilean Steel Project.—A modern steel plant is to be constructed in Conception Province, Chile, at a cost of 48,000,000 dollars. Ore from Coquimbo, 600 miles to the north of the projected plant, mined by the Bethlehem (Chile) Iron Mines, will be used as the raw material, while coal will be obtained from workings in the vicinity of the plant.

Czecho-Polish Chemical Co-operation.—Negotiations held recently in Prague have led to the conclusion of a five-year trade agreement between Czechoslovakia and Poland. It has been agreed that a delegation from the Polish chemical industry should visit Prague in order to discuss a division of the production of chemicals between the two countries to avoid unnecessary competition.

Norwegian Furnaces for India. — The Mysore Iron and Steel Works, Mysore, and the Elektrokemisk Industri of Oslo are reported to have reached an agreement regarding an expansion of the former company's plant. The plan provides for the purchase and installation of two electric furnaces of 13,000 kV each, and it is hoped to complete the work within three years, thereby making it possible to increase output from the present 50 tons to 200 tons daily from domestic ores.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

O. M. SEMAN, LTD., London, W., chemical manufacturers. (M., 19/7/47.) June 4, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on Lady Margaret Laundry, Kingsbridge Crescent, Southall. *Nil. August 8, 1946.

ACE PRODUCTS (MANCHESTER), LTD., Wilmslow, chemical manufacturers. (M., 19/7/47.) June 9, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the Bank; charged on land adjoining Manchester Road, Wilmslow, and buildings, etc., thereon known as Ivyhaven & Hillside Works, certain rent charge and land and buildings, etc., thereon abutting Ladyfield Street and Ladyfield Terrace, Wilmslow. *Nil. September 20, 1946.

Company News

British Glues and Chemicals has announced a final dividend of 20 per cent on the ordinary shares, making a total distribution of 25 per cent for the year ended April 30, 1947. Net profits totalled £217,827, which is nearly double last year's figure of £109,384.

Tunnel Cement Company is paying a final dividend of 5 per cent on its ordinary shares, making a total of 25 per cent for the year, less tax, for the 15 months ended March 31. Distribution for the previous 12 months to December 31, 1945, totalled 15 per cent, less tax.

The British Aluminium Company is to redeem all of its outstanding £3,135,559 4 per cent mortgage debenture stock at 104 per cent on December 31, 1947, when it will issue £3,500,000 3 per cent mortgage debentures redeemable over 40 years. Existing holders will be invited to convert into the new stock at 100½ per cent.

Thomas de la Rue and Company, plastics manufacturers and security printers, is to raise the final dividend on its ordinary shares for the year ended March 29 by 5 per cent, thus making 50 per cent for the year as against the previous year's total of 45 per cent. Trading profit amounts to £423,952 compared with £452,570 last year.

Anglo-American Asphalt Company announces a net profit for the year just ended of £10,903, of which £7700 has been distributed as a 10 per cent interim dividend. To the balance of £3203 was added the last year carry-forward of £27,777 to make the sum of £30,980 available. A final dividend of 10 per cent has therefore been recommended.

New Companies Registered

Mine Safety Appliances Company, Ltd. (437,745). — Private company. Capital £50,000 in £1 shares. Mechanical, electrical and chemical engineers, manufacturers of and dealers in machinery, safety devices of all kinds, etc. Directors: A. J. Toering and M. L. Symington. Solicitors: Coward, Chance & Co., 3 St. James' Square, S.W.1.

Pinden Whiting Co., Ltd. (437,835).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers and workers in whiting, lime, cement, sand, plasters, pigments, chemicals, etc. Directors: R. J. Musselwhite and J. K. Musselwhite. Solicitors: Stanley Jarrett & Co., W.C.1.

Kenmak Ltd. (437,966).—Private company. Capital £5000 in £1 shares. Importers and exporters of and dealers in goods of all kinds, including dyes, dyestuffs, chemicals, paints, varnish, colours, industrial, pharmaceutical and other preparations, natural and chemical fertilisers, tanning materials, etc. Directors: F. McKenzie and J. Keighley. Secretary: May Warwick. Registered office: 11 Peter Street, Manchester.

Industrial Detergents, Ltd. (436,314).—Private company. Capital £2000 in £1 shares. Chemical manufacturers, acid and alkali manufacturers, distillers and merchants, manufacturers of and dealers in disinfectants, fertilisers, insecticides and other chemicals for domestic, agricultural or horticultural use, etc. Subscribers: A. Tame and Miss Alice E. Crozier. Solicitors: Parsons, Evans and Francis, 13 St. George Street, Hanover Square, W.1.

Chemical and Allied Stocks and Shares

BRITISH Funds have failed to hold all last week's rally but, nevertheless, stock markets were not without good industrial features, although best levels were not maintained. Business in most sections was on a fair scale, despite the continued rush of new issues. Sentiment in markets is now rather less under the influence of international uncertainties and industrial shares are being bought as a hedge against the possibility of further inflation. Although it is recognised that the fuel position will result in lower earnings in some directions, the market is confidently expecting that many companies will benefit substantially from the abolition of E.P.T. and that higher dividends are in prospect for the current year.

Chemical and kindred shares reflected the better tendency. Imperial Chemical have rallied to 52s. 7½d., while Monsanto 5s. ordinary were 61s. 9d. Greeff-Chemicals Holdings 5s. ordinary 17s. 3d., and B. Laporte at £5 1/16 remained under the influence of the statements at the annual meeting. Fisons, however, eased to 65s., but Hardman & Holden 5s. ordinary remained active, changing hands up to 33s. 1½d. British Aluminium rose to 51s. on the big debenture conversion plan, and in other directions, De La Rue have steadied around 63s. 9d. following the raising of the dividend from 45 per cent to 50 per cent. In other directions, the units of the Distillers Co. have been active up to 153s. 6d. in anticipation of the final dividend, promised next month when the consolidated accounts are to be issued. The latter are awaited with considerable interest in the City as they will, of course, provide additional information as to the financial strength of the group, and also more details as to earning capacity, if a consolidated profit and loss account is also published. In other directions, Dunlop Rubber recovered to 79s. and there was a rise in British Drug Houses to 66s. 3d. on expectations of the shares commanding a higher relative price in their "split" form. Among other movements, Associated Cement recovered to 78s. 6d., and British Plaster Board strengthened to 31s. 6d., attention being drawn to the not unattractive yield at this level.

Movements in the iron and steel section were generally small, the big issue of the Steel Company of Wales monopolising attention, although Thomas & Baldwins have strengthened to 13s. 6d., Baldwins Holdings to 8s. 1½d., and John Summers to 29s. 6d. Elsewhere, Allied Ironfounders have improved to 69s. 6d. on the full results, and where changed, colliery shares recorded moderate gains. Tube Investments moved up to £7⅜, and among other shares, Borax Consolidated were higher at 60s. 6d., with Amalgamated Metal firm at 19s. 3d., the latter on hopes that the London Metal Exchange may be allowed to re-open later in the year.

British Glues & Chemicals 4s. ordinary have been firm at 23s. following the dividend increase, which was up to best expectations, and General Refractories 10s. ordinary shares were 25s. Moreover, Lever & Unilever at 56s. 6d. have participated well in the better tendency and Triplex Glass were better at 35s. Boots Drug were good at 67s. 3d., Sangers 37s. 6d. xd, Timothy Whites 54s. 6d., and Evans Medical shares marked 53s. 9d. Beechams 2s. 6d. deferred have been firm at 28s. the full report drawing attention to the varied interests and widespread business of the group at home and overseas. There has been considerable activity in oil shares under the stimulus of the Anglo-Iranian full report, which shows that the company's output reached a new high level and gives further news of big development plans. Anglo-Iranian were £10 5/16, Shell £5¼ and Burmah Oil 95s.

British Chemical Prices

Market Reports

THE demand for general chemicals appears to be no less active than during recent weeks, although quantities covered by delivery specifications are reported to be smaller on account of the approaching holiday season and annual shut-down of many industrial consumers. Call for shipment is not affected by these considerations, and overseas inquiries, which have been on a fair scale, have covered a wide range of products. Price changes up to the time of this report have been few and less than was expected in some quarters. There is nothing fresh to report on the coal-tar products market, prices being generally unchanged, with the demand maintained.

MANCHESTER.—Shippers have been rather prominent on the Manchester market during the past week with inquiries for a wide range of both light and heavy chemicals for overseas markets. There has also been a steady demand on home trade account, both in respect of new bookings and of contract deliveries. Firm prices continue in evidence in almost all sections. The demand for most descriptions of fertilisers is now seasonally quiet. There has been little change in the tar products sections, and pressure for deliveries of the heavy materials as well as of light distillates has been maintained.

GLASGOW.—In the Scottish chemical market there is little change to be reported. Home demands and supplies have been up to the average standard. Demand has been particularly heavy for Glauber salts and waxes of all descriptions. In the export market a number of orders have again been booked, but there is a very noticeable decrease in the number of inquiries being received. Overseas buyers are showing signs that they are no longer prepared to accept delivery dates for months ahead with a possible change of price in the meantime. It appears that American exporters in addition to being able to quote more favourable prices, are also quoting much better delivery periods.

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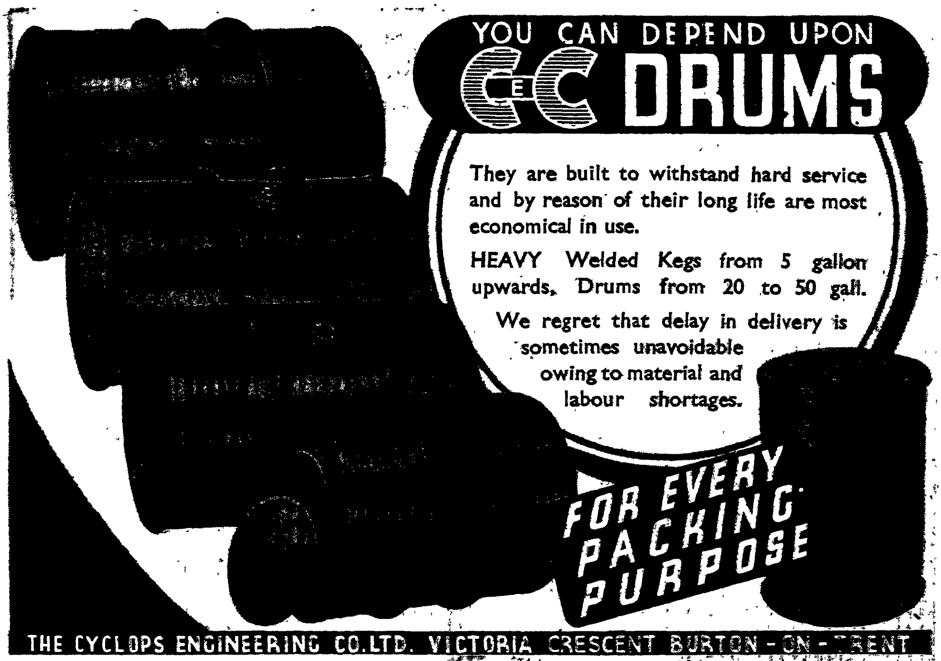

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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Method and composition concerning stabilising halogenated organic compounds.—Mathieson Alkali Works. Nov. 27, 1945. 29905/46.

Method and composition concerning the stabilisation of halogenated organic compounds.—Mathieson Alkali Works. Nov. 27, 1945. 31831/46.

Corrosion inhibitors.—Merck and Co., Inc. Nov. 30, 1945. 34372/46.

Process and apparatus for obtaining insecticide substances in a high grade of dispersion or pulverisation, through the incorporation of carbon dioxide.—C. R. Pla. Nov. 27, 1945. 33929/46.

Co-reaction products from drying oils and copolymers of cyclopentadiene and styrene.—Resinous Products and Chemical Co. Nov. 30, 1945. 21688/46.

Copolymers of cyclopentadiene and styrene.—Resinous Products and Chemical Co. Nov. 30, 1945. 21689/46.

Production of metallic agglomerates.—Soc. D'Electro-Chimie D'Electrometallurgie, et des Acieries Electriques D'Ugine. Nov. 29, 1945. 32900/46.

Production of powdered metallic alloys.—Soc. D'Electro-Chimie, D'Electrometallurgie, et des Acieries Electriques D'Ugine. Nov. 29, 1945. 32901/46.

Isomerisation process.—Standard Oil Development Co. March 21, 1942. 12518/47.

Manufacture of surface-active agents.—Universal Oil Products Co. March 23, 1945. 12788/47.

Process for refining hydrocarbon oil.—Aktiebolaget Separator-Nobel. Dec. 8, 1945. 35913/46.

Process for the production of opium alkaloids from dry poppy straw.—Alkaloida Vegyeszeti Gyar Reszventarsasag. Sept. 19, 1945. 14062/47.

Method of and materials for finishing surfaces.—American Chemical Paint Co. Dec. 13, 1945. 36907-8/46.

Catalysts and catalytic reactions involving the employment thereof.—Baker & Co., Inc. Dec. 10, 1945. 35470/46.

Sulphur compounds. California Research Corporation. Dec. 13, 1945. 31389/46.

Method of adhesively uniting materials, especially metals, and adhesives therefor.—Ciba, Ltd. July 13, 1945. 20829-30/46.

Manufacture of piperidyl ketones.—Ciba, Ltd. July 13, 1945. 20898-99/46.

Manufacture of azo-dyestuffs.—Ciba, Ltd. Dec. 14, 1945. 36003-44/46.

Method of removing manganese from magnesium.—Dominion Magnesium, Ltd. Dec. 12, 1945. 4064/46.

Colour characteristics of polymers.—E. I. du Pont de Nemours & Co. July 13, 1945. 20878/46.

Preparation of organic chlorides.—E. I. du Pont de Nemours & Co. Dec. 14, 1945. 36805/46.

Polymerisation of chloroprene.—E. I. du paring the same.—Merck & Co., Inc. Dec. 37050/46.

Process for the manufacture of chlorine addition products of aromatic compounds.—J. R. Geigy, A.G. Dec. 12, 1945. 36524/46.

Chemical compound and processes of preparing the same.—Merck & Co., Inc. Dec. 15, 1945. 36510/46.

Chemical compound and processes for preparing the same.—Merck & Co., Inc. Dec. 15, 1945. 36511/46.

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British Chemical Plant

THE manufacture of chemical plant is a highly important part of the general trade of the country and requires a very high degree of skill and experience.

That is one of the fundamental facts of which we were reminded at the recent meeting of the British Chemical Plant Manufacturers' Association, which at the same time opened up some new vistas of a great industry which urgently require to be explored.

It is in manufacturing and designing plant that the chemical engineer comes most truly into his own. He need not, of course, be associated with a plant manufacturer in order to do this. He can design his plant and have it manufactured for him by competent engineers. That method of procedure is no doubt satisfying to the chemical engineer himself, but we doubt if it represents the ideal condition. The manufacture of chemical plant should be an integral part of industry undertaken by specialists equally skilled in theory and practice.

This dictum is debatable—what point of view is not? There are many who faintly dislike the "contractor." There are, or were, technical bodies into which the man employed by a contractor was not admitted, apparently through some strange belief that he would use his membership only to promote his firm's interests. This curious Victorian survival is fast disappearing and a healthier outlook is taking its place.

The German chemical plant industry was among the great engineering industries of the country, and there is no apparent reason why British chemical engineers should not enable this country to take the place so long occupied by the Germans. To Germans the chemical plant industry was more than important; it was part of the German drive for world domination. The great manufacturing concerns of that country employed staffs of designers, chemists and engineers who were able to supply chemical plant for the manufacture of an astonishing range of products to chemical industries all over the world. Skilled propaganda convinced quite a considerable section of even informed opinion that German designers and manufacturers were second to none, and superior to almost everyone. Technical salesmen lived abroad and sold German products. The German export of chemical plant reached very large tonnages. The excellence of these plants added lustre to the German name, a lustre that was deserved so long as it was related only to the arts of peace.

The Allies are convinced that the German chemical plant industry must not be allowed in our time to be re-established, because chemical plant can so easily be diverted to the manufacture of munitions of war. Modern war is based on chemistry.

The disappearance of the German chemical plant industry will leave a gap into which we should now be rushing as air into a vacuum. Are we doing so? It is essential that this country should concentrate upon the manufacture of goods that require greater skill and experience, greater knowledge in design, than are available in most lands. The newer industrial nations can make the commonplace goods, boilers, wheelbarrows, simple castings, and so forth. The older industrial countries, such as Britain, can readily export only specialised

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goods. What is more specialised than chemical plant?

The annual report and the speeches of the Chemical Plant Manufacturers were good indications of the measure of the B.C.P.M.A. members' success in becoming chemical plant manufacturers to the world. It appeared that much remains to be done. The director is visiting many lands to act as the ambassador of the chemical plant industry. We have no doubt that the association members are following up his efforts by visits from their own representatives. There is nothing that sells plant more readily than personal contact. It might, moreover, be well worth while to send abroad some of the adventurous young men, now so willing to emigrate, to sell British plant, after giving them reasonable training.

The greatest obstacle in the way of developing the chemical plant industry is the difficulty of the plant manufacturer in gaining experience in the design of plant to deal with unfamiliar processes. Unit plant can generally be designed adequately from a knowledge of the properties of the materials with which it is to deal. The difficulty arises when a whole process is to be installed. A method of performing the necessary chemical reactions and physical processes can be devised, but is not necessarily the best method.

Experience has taught manufacturers of chemical plant that they can rarely specialise remuneratively in a particular type of process. We have advocated from time to time in these columns that there should be liaison between the chemical manufacturer and the chemical plant manufacturer in the design of new plant and in its performance under guarantee. There have been difficulties in the way of securing this admirable collaboration, not the least being that the chemical manufacturer may thereby give his foreign competitor a flying start. There are several ways of circumventing this; often it would be practicable for the British firm to take a financial interest in the foreign firm, or for the two to form one organisation—in which way our overseas investments could be slowly rebuilt.

In our view—perhaps here we are in advance of public opinion—whatever is the overseas policy, the chemical industry and the chemical plant industry in this country should be indivisible, or at least undivided. There will always be a majority of firms which regard chemical plant manufacture as one of many activities, for there is not enough chemical plant needed to keep a really large firm of engineers constantly employed. The time will come when this will be so, but it has not arrived yet. Such firms may be independent, or they may have relationships with those specialising in certain types of process. There will, however, always be more peculiarly chemical engineering firms able to design complicated chemical process plant, given the general know-how, and it is these firms that must collaborate most closely with individual chemical manufacturers, feeding the purely engineering firms with orders.

What type of arrangement has been made, we have no means of knowing, but, a start at least, has been made. No effort must be spared now to enable the British chemical plant manufacturing industry to take its place as the foremost of its kind in the world. We commend that idea to Sir Stafford Cripps as a plank in his export drive.

NOTES AND COMMENTS

The Celebrations End

THE end of this week will have seen the termination of one of the most memorable—and perhaps we may say hectic—fortnights in the history of chemistry. The two weeks started with the official opening of the Centenary Exhibition at the Science Museum and was followed on Tuesday by the reception by the president of the Chemical Society of delegations and guests who were taking part in the centenary celebrations—and a very colourful and pleasant ceremony that reception at the Westminster Hall was. Then came the Centenary Address, with the Centenary Dinner in the evening. At this function the head of the British Government, the Rt. Hon. C. R. Attlee, paid a warm tribute to the Chemical Society, which was echoed by speakers for the distinguished gathering. Wednesday saw the delivery of the Faraday Lecture of the society by one of the foremost chemists of the day, Sir Robert Robinson, who holds the very honoured position of president of the Royal Society. On Thursday evening the Royal Society itself played host to several thousand guests including delegates to the XIth International Congress of Pure and Applied Chemistry. That morning had seen the opening of this congress by Viscount Leverhulme and the opening of meetings of the International Union of Chemistry by Professor Bogert. This week there have been official meetings of these two bodies as well as numerous social outings and official visits to laboratories and works. We think that a lot has been crowded into these two weeks, but it has been very pleasant and instructive.

A Notable Absence

HE is a bold man these days who writes on any aspect of atomic energy. For this reason alone it is refreshing to see an article by Sir Wallace Akers on some aspects of the problem in *I.C.I. Magazine*. With the " black-out " on news of atomic research we welcome even a reiteration of knowledge which may already have been published in some journal and is therefore immune from the penalties of the Atomic Energy Act. Sir Wallace discusses the question of the use of thorium in an atomic energy plant and comes to the conclusion that given some uranium to start the reaction, the thorium plant would continue as a self-containing atomic energy unit. It is a pity that this subject and others impinging on atomic energy were not discussed at the International Congress. The silence on this subject since that remarkable document the Smythe Report has been more deafening than the reverberations of the atomic bomb itself. We venture to suggest that, as one professor has already remarked, if this document had been margined with red, marked " strictly confidential " and passed to the U.S.S.R. with a note that it was for Marshal Stalin's eyes only, the Russians would not now be so suspicious of the Capitalist West. However revealing, though, that document was —and it seemed to us to give all the information necessary for a powerful government to start up an atomic energy research programme—there have undoubtedly been many advances and refinements of method in the chemistry, physics, geology and engineering connected with atomic power. It occurs to us that as scientists find out more on these subjects their fields will necessarily widen and the number of subjects coming under the official ban will increase. We hope, with Professor Hinshelwood, that the whips of past commercial secrecy will not give way to the scorpions of military secrecy.

Practical Research

THE widespread acceptance by industrialists, student and research bodies and others of invitations issued last week by the Department of Scientific and Industrial Research to study what is being done at its Chemical Research Laboratory, Teddington, points to the probability of such visits being made annual events. A visit to Teddington was one of the more popular events provided for members of the Chemical Society in connection with its centenary celebrations and a party of about 100 accepted the invitation to tour the laboratory on Thursday. Wednesday was a " private view " day for the Press and for other groups of the D.S.I.R. and at other sessions the very lively interest of those associated with chemistry in industry has been demonstrated by the parties, necessarily restricted to about 100, which have shown a tendency to linger in some sections of the 14 specialist laboratories longer than is agreeable with the programme. Most encouraging are the evidences of the conversion of the laboratory from its war to peacetime rôle, and the progress that is being made in dealing with the practical problems of industry, to which the laboratory's discovery of ion-exchange resins and anodic oxidation of aluminium were most acceptable contributions in the past. Emphasis at the moment lies in an equally practical direction : the prevention of corrosion of metals, on which some very interesting work was shown last week directed from the angle of inhibiting the activity of anaerobic bacteria which, by their propensity for reduction of sulphate, are potent factors contributing to the destruction of metal in clay and wet soils. The best hope at the moment seems to lie in an attack on the bacteria themselves, in which much exploratory work is visible at Teddington.

If . . . .

REMINISCENCE has been in the air lately. Events such as the centenary exhibition of chemistry and reunions in London between chemists whose paths diverged long ago have combined to remind us how far-reaching have been the results of investigations and decisions taken in the past. Perkin's resolve to continue the investigations which, just over 90 years ago, produced the first coal-tar dye is among the more obvious examples, and there must necessarily have been others, known to few, which have had almost equally decisive effects in moulding chemical history. Lord McGowan seems to have added yet another to a table of notable events in chemical industry when he publicly recorded that but for a decision by Sir Stafford Cripps shortly after World War I he, instead of Lord McGowan, might now be chairman of I.C.I. Sir Stafford, he related, who was then making his way at the bar, was invited to take charge of a partly developed site at Billingham which Brunner Mond & Co. had acquired from the Government. He decided to stick to law. The outcome, one now recalls, was that Sir Harry McGowan, who built out of the Nobel Explosives Co. (which he had joined as a junior clerk) one of the leading chemical undertakings in the world, soon had the opportunity of exercising his phenomenal flair as an organiser in the potent field created by the merger of Brunner Mond & Co., the United Alkali Co., British Dyestuffs Corporation and Nobel Industries, Ltd. Under his direction I.C.I. has become the biggest industrial undertaking in this country, with total assets of more than £140 million. The temptation to continue the analogy is hard to resist. If Sir Stafford Cripps were now its chairman, would I.C.I. control 95 very prosperous companies? And would Lord McGowan, as President of the Board of Trade, have been content to report the present crushing adverse balance of trade. . . ?

River Pollution

The Secretary of State for Scotland has called for a survey of damage effected by river pollution in Scotland and local and county authorities have been asked to submit any evidence which might justify an amendment to present regulations operating in Scotland on this subject.

A number of local authorities are understood to be preparing statements with a view to submission.

There is a possibility that this action may have been encouraged by repeated complaints regarding pollution of Border and Central Scotland rivers by trade effluents, and that any proposed legislation may have a limiting effect on the industrial concerns involved.

As others see the Centenary Celebrations

STINKER!!
WELL, IF IT ISN'T OLD STINKER!
STINKER
WAY! DEAR OLD STINKER!
STINKER MINOR!
BY ALL THAT'S WONDERFUL
BLESS MY SOUL!
STINKER MAJOR!
MY OLD PAL, STINKER!
STINKER OLD BOY!!
DEAR OLD STINKER!
BY JOVE, IT'S OLD STINKER!
STINKER!
MY DEAR OLD STINKER!
GOOD OLD STINKER!
STINKER, OLD CHAP!
C'LOR! OLD STINKER HIMSELF!!
STINKER!

"It's a family reunion. 'Aven't seen each other for a 'undred years."

[*The Evening News.* London Laughs, by Lee.

I.C.I. DYESTUFFS DIVISION

"Empire's Largest Chemical Research Department"

"YOU cannot subdivide the field of organic chemistry and say that in this particular area we are concerned with dyestuffs and in that area we shall find rubber chemicals and medicinals. These areas overlap one another in the most extraordinary manner, and it is quite impossible to set up boundary lines."

That is one of the reasons (given in the July issue of *The I.C.I. Magazine*) to explain the diversity of activities, many totally unconnected with dyestuffs, now carried out by the I.C.I. Dyestuffs Division, which markets more than 6000 products—more than all other products of I.C.I. put together. Dyestuffs now represent little more than 60 per cent of the division's output, and textile processing and finishing materials, rubber chemicals, synthetic resins, synthetic rubber, nylon polymer and medicinal and insecticidal products are collectively almost equally important in the group which employs approximately 10,000 persons in seven factories and whose activities are controlled from Hexagon House, Blackley, Manchester.

Largest Research Department

Hexagon House, as the nerve centre, houses the largest of I.C.I.'s research departments, which is also the largest group of chemical research laboratories in the Empire. It employs nearly 600 people, of whom about 300 are qualified scientists, and is divided into six divisions, concerned with dyestuffs, medicinal chemicals, polymers, general organic chemicals, physical chemical research, and chemical engineering and operating problems. Its work can be roughly divided into three categories: (a) the discovery of new products, (b) the development of manufacturing processes for selected new products, and (c) the improvement of established processes.

Of the five major dyestuff discoveries made in the inter-war years, three—*The I.C.I. Magazine* recalls—were produced by the Hexagon House research department: Caledon jade green, Monastral blue and Dispersol and Duranol dyes, "the first complete range of satisfactory colours for acetate rayon." In other fields, the development of a process for large-scale production of mepacrine, the discovery of paludrine, the production of perspex and Methoxone selective weed killer testify to the pioneering spirit of the research department.

A specially important aspect of the work done at Hexagon House, and one which has contributed largely to the continued widening of the division's industrial services, is that provided by the liaison and research organisations thus providing a link between the laboratory work and the actual and potential use of the division's products.

"A research chemist," the article points out, "is concerned solely with chemistry. Through chemistry he is able to discover a new product and to define how it will be made. But this is as far as he goes. To decide whether and how that new product can be useful for this, that or the other purpose calls for an entirely different type of knowledge and experience.

Experts as Judges

"It needs a man skilled in the arts of dyeing and printing to decide whether or not a new dyestuff put forward by the Research Department is of any use. Similarly, a medical man must have the final say as to the value of a new drug, and so on. The service departments and the Biological Department are, therefore, the judges or referees."

The same spirit animates the operation in Manchester of the research experimental plant, which serves as a factory in miniature, designed for trying out on a small scale new processes arising from the laboratory in which the works have not already had sufficient experience. It is also used for manufactures which are still on too small a scale to be handed over to a factory.

CHEMISTRY AND RAILWAYS

CHEMISTRY is the honoured friend and helper of the railways and the products of the chemical industry are essential to their existence. This acknowledgment is made by the railway companies in the course of a study which they have just issued co-operatively, entitled "Chemistry on the British Main Line Railways."

The publication reveals the fact, not widely recognised, that the British railway companies together are more deeply concerned with chemistry over a wider field than any other individual undertaking, calling for the maintenance of large research staffs. In addition to the obviously important subjects of water and fuel utilisation, nearly every other branch of applied chemistry comes within the scope of the railways' activities and is the subject of research work by them.

Such work has usually important applications in other departments of industry, notably such things as the chemical study of paints and materials and production of improved synthetic formulations and the study and prevention of corrosion. The railways are, in fact, an important part of the country's equipment for scientific research.

OVERSEAS TRADE

OVERSEAS trading in chemicals does not appear to have contributed materially to the fair improvement in total export figures in June, equivalent to 7 per cent more than the trade secured in 1938, when allowance has been made for the increased current values. Total exports of U.K. goods last month were worth £93.13 million, the best monthly post-war total yet recorded, and compare with £65.38 million in June, 1946. Even higher, proportionately, was the increase in imports, totalling in June £153.84 million against £102.87 million a year ago. The largest individual factor contributing to the increased export were motor vehicles, which reached a new record of £14.4 million.

Chemical trading figures in June, with few exceptions, show reduced volumes, contrasted with a year before. Yet the total trading figure for chemical manufactures (excluding drugs and dyestuffs), £3,042,548, represents an increase of £143,024 above the equivalent total in June last year. Notable among the quantitative reductions of total chemicals sent overseas last month were: Sodium carbonate, 185,713 cwt. (1946, 267,768 cwt.); caustic soda, 99,443 cwt. (152,778 cwt.); sodium sulphate, 53,519 cwt. (211,011 cwt.); chloride of lime, 34,312 cwt. (69,048 cwt.), and ammonium sulphate, 17,108 tons (26,435 tons). Among the very few increased chemical exports were: Salt, 13,186 tons (10,276 tons); nickel salts, 10,657 cwt. (2226 cwt.); synthetic sodium nitrate, 7929 cwt. (4971 cwt.); disinfectants, 48,260 cwt. (42,870 cwt.), and tar oils, 3,300,276 gall. (393,603 gall.).

New Chemical Factories

WHILE comparatively few of the new Scottish industrial estate factories are directly concerned with chemical manufacture, many will offer important work to chemical manufacturers and agents in Scotland. Since VE-Day, 336 major schemes have been approved and 61 of these have been completed and production started. Some have been financed by the Government, among them the Hillington factory of Charles Tennant, Ltd., manufacturing chemicals. Among privately financed projects is the soft soap factory sponsored at Glasgow by Sadler & Co., Ltd., and the new plant for Sunshine Bleach (Hillington), Ltd., for the manufacture of bleach products. Other newly approved projects include: Boots Pure Drug Co., Ltd., a new factory of 270,000 sq. ft. at Airdrie; I.C.I., Ltd., explosives factory at Ardeer; Distillers Co., Ltd. (Kirkliston), a distilling plant of 55,780 sq. ft. at Broxburn; Auchentoshan Distillery, distillery at Clydebank of 34,000 sq. ft.; Cooper MacDougall & Robertson, Ltd., insecticide factory at Glasgow.

INDUSTRIAL ESTATES

THE Board of Trade, in consultation with Scottish Industrial Estates, Ltd., is considering the establishment of six new industrial estates in Glasgow on sites recommended by Glasgow Corporation. The provisional sites of these estates was announced by Mr. C. A. Oakley, Regional Controller of the Board of Trade for Scotland, in Glasgow last week, when he reviewed industrial developments in the West of Scotland.

In his survey of the development of new factories and the encouragement of new industries in the West of Scotland, Mr. Oakley said that in the four remaining blocks of Government factories at Linwood, Germiston, Cardonald, and Coltness, almost all the available space had been taken up. At Linwood there would be considerable expansion when a firm of steel workers from the south took over part of the factory. The arrangements, which were now well advanced, would permit William Beardmore & Co., Ltd., steel manufacturers, who occupied part of the site at present, to continue production.

Some concern had been expressed three weeks ago when it was announced that Rolls-Royce, Ltd., Hillington, Glasgow, had decided to transfer its precision foundry to Derby, said Mr. Oakley, but a Scottish firm of steel manufacturers was negotiating to take over the foundry more or less as a running concern and would continue to do precision casting there.

Negotiations were proceeding with firms manufacturing pharmaceutical drugs to establish large factories at Irvine and Ardrossan. Lord Trent, chairman of Messrs. Boots Pure Drugs, Ltd., had recently announced that his company were interested in acquiring space at Irvine in addition to the factory now under construction at Airdrie.

Business Visits to Germany

Better Facilities

AS the result of improved facilities in Germany, reports the Board of Trade, it will be possible for an increased number of business men to visit the joint U.K./U.S. zones of Germany to buy goods and services. In future all applications to visit these zones should be sent to the German Division, Board of Trade, Millbank, S.W.1, giving full details of the proposed transaction and itinerary.

Firms are reminded that trading with Germany is subject to the normal import licensing and exchange control regulations. Business men who wish to sign contracts in Germany are therefore advised to make sure before departure that the necessary import licences will be forthcoming.

Chemical Centenary and International Congress Supplement

26 July 1947

CHEMISTS AT THE ROYAL SOCIETY

NEARLY 3000 people attended one of the greatest international scientific gatherings ever held in London, when the Fellows of the Royal Society held a reception at Burlington House in Piccadilly on Thursday, July 17, on the occasion of the celebrations of the Centenary of the Chemical Society and of the meeting of the International Congress of Pure and Applied Chemistry. Delegates of some twenty-five nations attending the meeting of the International Union of Chemistry being held in the Royal Society's rooms from July 18-24 were also at the reception. Among the company were some of the delegates to the International Physiological Congress which is due to take place in Oxford later in the month.

In this special supplement will be found, in text and pictures, the story of the centenary celebrations and the meeting in London of the XIth International Congress of Pure and Applied Chemistry. This is a record of a memorable week which will live long in the annals of chemistry.

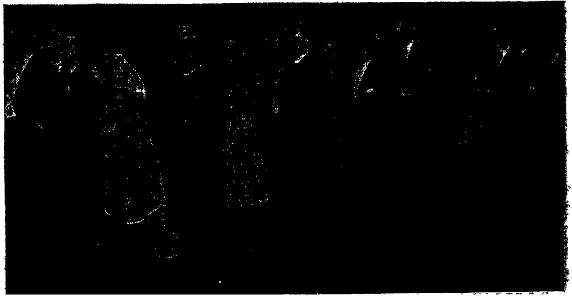
Sir Robert Robinson, president of the Royal Society, received the guests who included a number of ministers as well as ambassadors of countries represented at the International Congress. For this great occasion the Royal Academy of Arts lent its galleries and a number of other scientific societies which have apartments in Burlington House, including the Chemical Society, the Linnean Society and the Geological Society, opened their rooms.

The contributions made to early chemical discoveries by some of the Fellows of the Royal Society, such as those of Robert Boyle, Joseph Priestley and Michael Faraday, were illustrated by exhibits in the Royal Society's library.

In the rooms of the Chemical Society were hung portraits of the many distinguished chemists who have taken a leading part in the history of the Chemical Society during the hundred years of its existence. Some fifty congratulatory addresses presented to the Chemical Society on the occasion of its Centenary were also exhibited.

The Linnean Society exhibited some of the rare specimens from the collection of Linnaeus, the eighteenth century scientist from whom the Society takes its name. In addition to these scientific exhibits, guests were able to view the 1947 Summer Exhibition in the Galleries of the Academy and during the evening two short programmes of music were given by a string quartet composed of scientists in one of the Royal Academy's Galleries.

Unfortunately shortly before the reception, heavy rain fell and continued for some hours. But this did not deter the guests, whose cars and taxis caused hold-ups in Piccadilly. So many people were waiting to be received by the President of the Royal Society, Sir Robert Robinson, that queues, stretching from the Royal Society into Piccadilly on the one side and into the Royal Academy on the other, were formed.



Some of the guests waiting outside the Royal Society to be received by the President.

PRIME MINISTER AT CENTENARY DINNER

PRAISE FOR CHEMISTS

THE Prime Minister, the Rt. Hon. C. R. Attlee, was the guest of honour at the centenary dinner of the Chemical Society held at the Dorchester Hotel, London, on Tuesday last week, and which was presided over by the president of the society, Professor C. N. Hinshelwood. Over 300 well-known people in the chemical world and guests were also present to do honour to their society. They included Viscount Samuel, Sir Edward Appleton, Professor E. Berner and Mrs. Berner, Sir Alfred Egerton, Sir Henry Dale, Sir Harold Hartley, Sir Norman and Lady Haworth, Viscount and Viscountess Leverhulme, Sir Edward Mellanby, Lady Mond, Lord Rayleigh, Sir Robert and Lady Robinson, Sir Robert Robertson and Sir Henry Tizard.

Professor C. N. Hinshelwood received the Prime Minister, who was accompanied by Mrs. Attlee, while the other guests were received by the three honorary secretaries of the society, Professor W. Wardlaw, Dr. J. L. Simonsen and Professor D. H. Hey, together with Mrs. Wardlaw and Mrs. Simonsen.

Prime Minister's Toast

The Prime Minister, who proposed the toast of "The Centenary of the Chemical Society," said it was an honour to propose this toast. "Let me say at the outset," said the Prime Minister, "that among the many subjects of which I am totally ignorant chemistry takes a very high place. But then," he added, "I am equally undistinguished in the classics.

"I belong to a party," he continued, "which has had the purpose for many years of effecting great changes in our social and economic system. And it is to-day carrying out some quite considerable changes. Among the abusive terms which have been said of us is the term revolutionary. But believe me any revolutionary changes brought about or conceived by my friends and myself pale into insignificance against the revolution effected by the chemists. All the time chemists were effecting epoch-making discoveries, sometimes with disconcerting results."

Mr. Attlee went on to say that 100 years ago the chemists' contribution to our national life was comparatively insignificant. To-day it was the corner stone of the economic structure of every civilised country; indeed, the whole fabric of the world to-day, both in war and in peace, depended on the chemists. Therefore, as a mere politician he approached chemists with great reverence.

One hundred years ago coal was a convenient substitute for wood for burning; to-day it was the raw material of a number of industries, remarked the Prime Minister, and he had himself travelled around in order to see the amazing things which the chemists pulled out of coal. Years ago he had thought it was just black, but the chemists had dragged out of it all sorts of things that were white.

The chemists had had a hand in the development of the internal combustion engine, and had co-operated with the metallurgists in producing the new alloys which stood up to the intense heat and pressure of modern processes. The ladies, too, were indebted to the chemists for the synthetic materials, such as rayon, which they had produced to supplement the efforts of the humble silk-worm. An immense amount had been done by the chemists to protect our lives, in ensuring the purity of water and food supplies.

The Prime Minister also mentioned drugs, plastics and the atomic bomb as products in which the chemists played a considerable part.

All these things changed the nature of the universe, he said. The chemists, however, always expected the unfortunate politician to adapt our institutions to the discoveries they made. In their quiet way chemists asked why the rotten Government did not do this, that and the other; they were unconscious of the fact that they had caused all the trouble. The moral of it was that governments must keep in close touch with the chemists and try to obtain early news of developments.

Past Neglect

Referring to industrial use of new inventions, the Prime Minister said that great inventions had been made in Britain in the past in the realms of chemistry, but were neglected by our own people and developed overseas. He could not have that happening in the future, because the future of this country depended on our utilising to the full all the inventions and all the knowledge we could. This great country had plenty of good brains, plenty of inventions, and we had kept ahead of the other side in many things during the war.

Proposing the toast and welcoming the presence of many foreign chemists, Mr. Attlee said it was pleasing to know that at least 23 countries were represented at the celebrations of the Chemical Society to mark its centenary. He was sure that the society, which had grown to such strength from small beginnings in the past

(*Continued on p.* 131)

CENTENARY ADDRESS*

By PROFESSOR C. N. HINSHELWOOD

(President of the Chemical Society)

THE Chemical Society was founded in the year 1841. The England in which it came into being stood on the threshold of one of its greatest eras of expansion, but no one at the time could know of this, and to many the prospect must have appeared sombre and even fuller of uncertainties than that which confronts us to-day. The dislocations caused by the industrial revolution were all too obvious, but the fruits of progress were still to be gathered. The lot of the impoverished manual workers was wretched in the extreme. The scandals of child labour in coal mines, potteries and other industries were coming to light, but the Factory Acts were not yet passed, the agitation and distress connected with the Corn Laws coloured the political scene, and the demand of workers for a better mode of life expressed itself in the Chartist movement and broke forth into riots which to many people suggested that society was on the verge of revolution and disruption.

Queen Victoria was on the throne, but the splendours of her era were yet to be, and the great movements of her time would only have been discernible to those of unusual penetration. The worst social conditions depicted in the writings of Dickens still prevailed. There was nothing in the obvious character of the time to announce a period of intellectual flowering, and yet it was just then that many learned societies, including our own, came into being. Scientific studies in England were hardly in any clear way the product of their age, and sprang more from the learned curiosity of amateurs than from the conscious needs of society. There were practically no laboratories for chemical research, and little or no university instruction in chemistry.

Comparison with Today

The chemical stage was set as follows. In 1841 the time which had elapsed since the " chemical revolution " of Lavoisier was almost exactly equal to that from the discovery of radioactivity to the present day. Chemistry as a science was then as old as is now the new nuclear alchemy upon which we believe the future so largely to depend. It is difficult to-day for a scientifically educated person to realise how profound was the change of thought which followed the publication of the Lavoisier treatise. It represented a complete philosophical reorientation of ideas on the nature of substance. Two Englishmen in very different ways had played parts of the first magnitude. Priestley, whose house was wrecked by a mob, had made the discovery which opened the way for Lavoisier, and Dalton, living in an obscurity which astonished his foreign visitors, had formulated the theory upon which all future development was to depend.

Between the time of Dalton and the foundation of the Chemical Society the great forward sweep of organic chemistry had begun, but in this the English school had played little part, as was explicable in a country which tended to produce a few of the finest flowers of science, art and literature without any very vigorous general growth of leaf and root. At the moment of our foundation Dalton was still alive, but Liebig, who visited England at about this time, found little in the world of chemistry to inspire him. Yet Faraday was at the height of his powers and his great work on the laws of electrolytic action was already accomplished. Its full implications were far from obvious to his contemporaries, and indeed the confusions which Avogadro's paper of 1811 might have cleared away still clouded chemistry. On the Continent the great battle between the rival interpretations of the structure of organic compounds was at its height.

Faraday and Graham

At about this time much was being done in England to lay the foundations of physical chemistry, not only by Faraday with his work on the liquefaction of gases and on electrochemistry, but also by the original and versatile Thomas Graham, first president of the Chemical Society

Such was the chemical scene at the time of our foundation. If the curtain is raised every 20 years the following is seen. By 1861 chemistry had seen two decades of steady progress but had been on the whole unshaken by revolutionary changes. Cannizarro's paper of 1858 had removed one of the major obscurities and Frankland and Kekulé had placed structural chemistry on a firm foundation. In this country Hoffman, Mansfield, Williamson and Frankland are seen among the outstanding figures of the period. In England it was still mainly the affair of the amateur. Indeed, in 1867, the only technical education in Leeds, with its quarter of a million inhabitants, was provided by one teacher who worked in a cellar

(Continued on p. 120)

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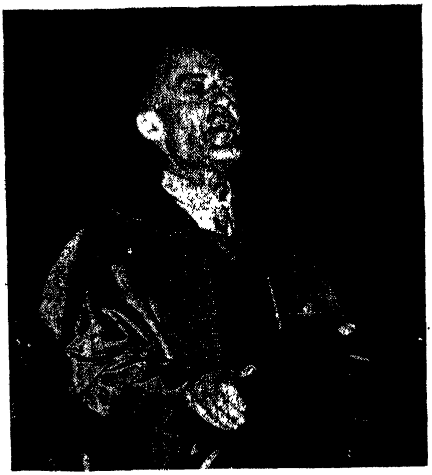
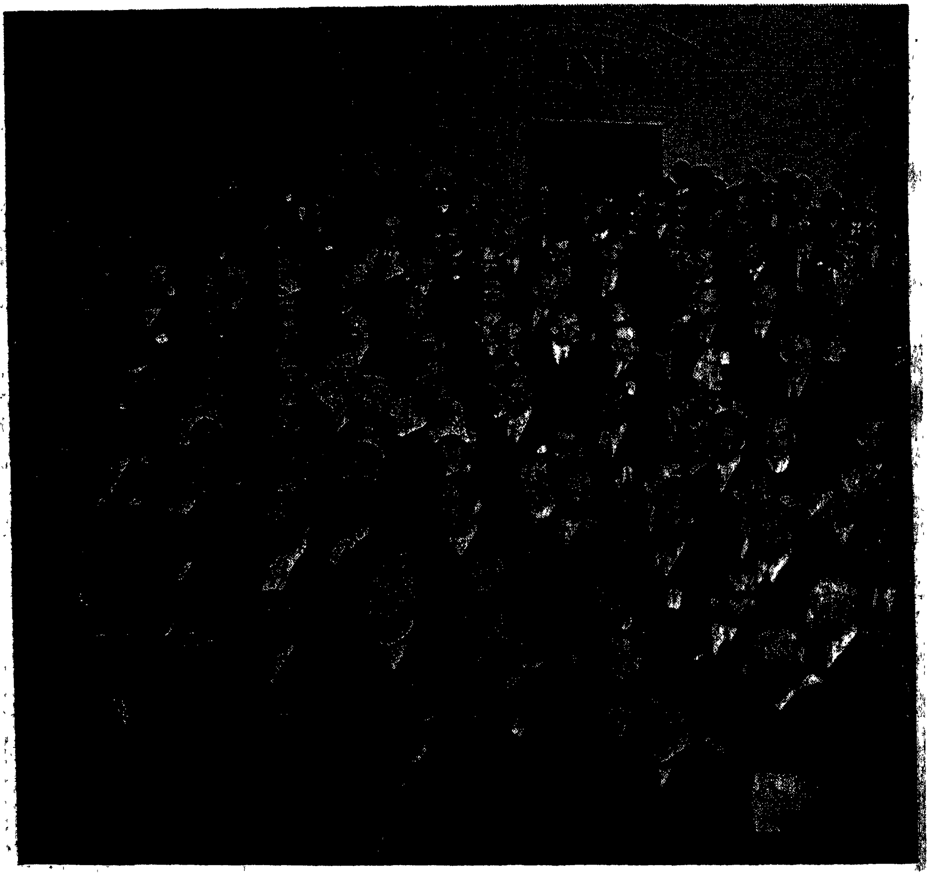
* Delivered at the Central Hall, Westminster, July 15, 1947.



RECEPTION AT

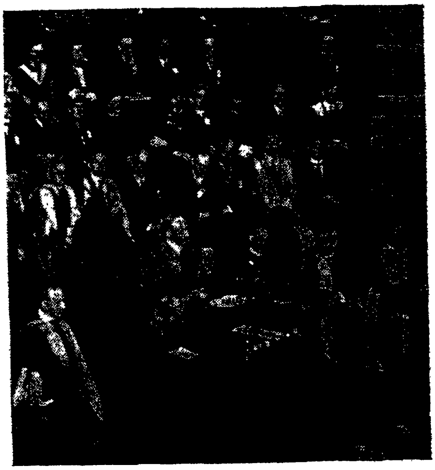
On this and the next page are photographs taken during the impressive and colourful ceremony at the Central Hall, Westminster, when Professor C. N. Hinshelwood received delegates from home and foreign societies who gathered to present addresses of congratulation to the Chemical Society on reaching its hundredth birthday. Some of the delegates also brought welcome gifts. The reception of the delegates, most of whom were in academic robes, was one of

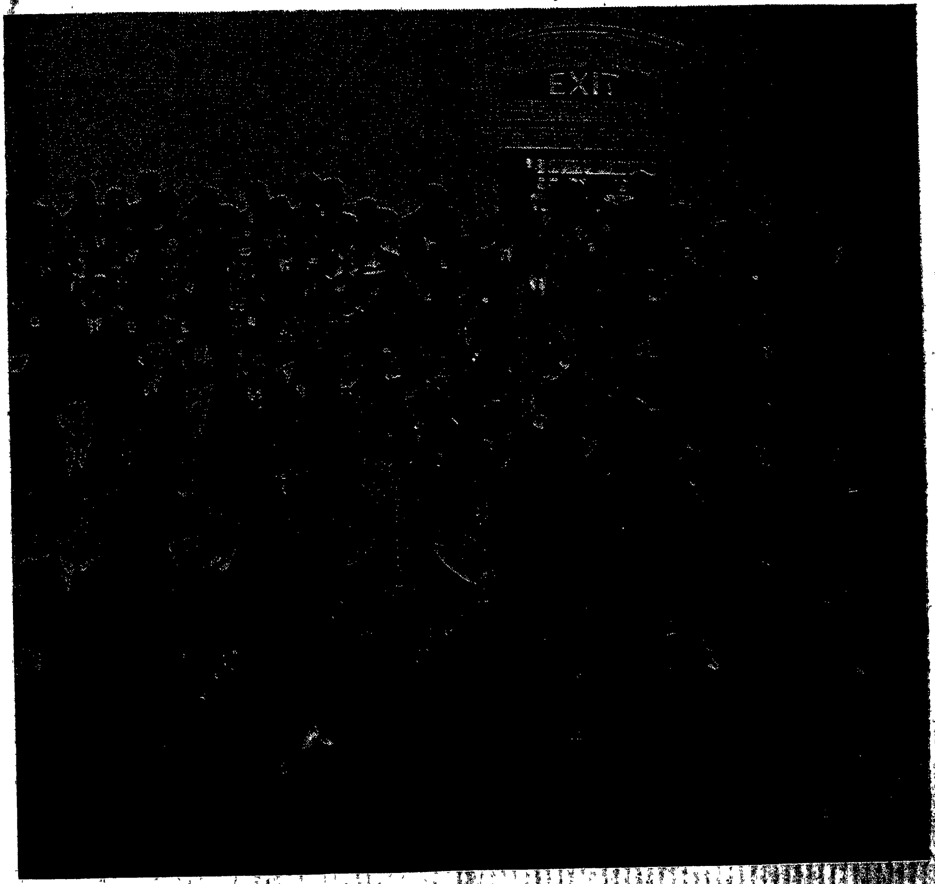


Part of the gathering at the Central Hall.

CENTRAL HALL

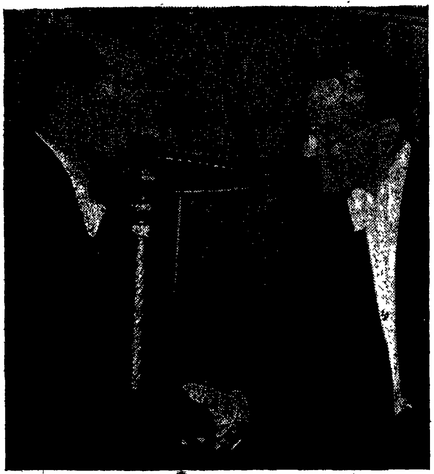
the most charming and picturesque ceremonies seen in London. The lower pictures on these two pages show the presidential procession, headed by the mace-bearer with the president immediately behind entering the hall to receive the addresses of congratulation. On the left Professor Hinshelwood is seen addressing the gathering, and on the right a general view of part of the platform after the delivery of the congratulatory messages.





The Presidential procession entering the Hall.

Celebrities at the Centenary Dinner



Mr. Attlee is greeted by Prof. W. Wardlaw.

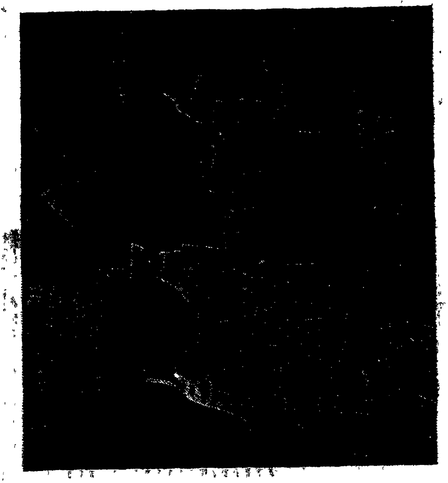
Prof. C. N. Hinshelwood in conversation with Mr. and Mrs. Attlee.

A group of notabilities, including Sir Robert Robertson, Sir Harry Lindsay, Sir Edward Appleton, Mrs. Pauling, Prof. Pauling, Sir Harold Hartley, and Prof. J. N. Bronsted.

(Top left, from left to right) : Dr. F. M. Hamer, Mrs. J. L. Simonsen, Miss Thomas, Dr. M. A. Whiteley and Dr. E. Chu, at the morning reception.

(Top right) : Dr. L. H. Lampitt (central figure) at the Centenary Dinner. To his left are his Guest and Sir Robert Pickard, while Mrs. Jean Irvine and Mme. Delaby are seated to his right.

(Right and below) : Further shots taken at the Centenary Dinner.



I.C.I. DANCE AND CABARET

Connaught Rooms Reception

THERE was a happy gathering at the Connaught Rooms, London, on Wednesday of last week when the directors of Imperial Chemical Industries held a reception for delegates of the Chemical Society Centenary Celebration and the XI International Chemical Congress. Over 1400 people were present to dance and watch the cabaret.

Among the many notabilities present were: Prof. C. N. Hinshelwood, president of The Chemical Society, Sir Robert Robinson, president of The Royal Society, Col. M. T. Bogert, president of The International Union of Chemistry, Prof. R. Delaby, International Union of Chemistry's secretary, Dr. L. H. Lampitt, president of The Society of Chemical Industry, and the following directors of I.C.I.: Lord Ashfield, Sir Wallace Akers, Dr. C. J. T. Cronshaw, Dr. A. Fleck and Mr. W. F. Lutyens.

Owing to the indisposition of Lord McGowan, I.C.I. chairman, guests were welcomed by Lord Ashfield, who later addressed them at the microphone. He spoke of Lord McGowan's deep disappointment at being unable to attend, as he had been looking forward to the event with great enthusiasm. Lord Ashfield extended an especially cordial welcome to delegates to the Eleventh International Congress of Pure and Applied Chemistry.

The dance floor presented a colourful scene as guests danced to Tommy de Rosa's orchestra. Caution was thrown to the winds when cabaret artistes Georges André, Martin, and Clayton and Shires performed their acts. Carried away by enthusiasm, the audience dispensed with formality and ignored the dignified restraint and conventions more usually associated with functions at the Connaught Rooms by standing on the plush-seat chairs and leaning forward on the shoulders of fellow guests.

The occasion was an unqualified success, and one that does credit not only to Mr. F. W. Pratt (who organised it) and the directors of I.C.I., but to the organisation as a whole. Catering arrangements were exemplary. To sum up: Connaught Courtesy—Chemical Conviviality.

VISIT TO BRITISH DRUG HOUSES

One of the items in a notable programme of the Centenary Celebrations was a visit of more than 100 delegates to some of the departments of The British Drug Houses, Ltd., on Wednesday, July 16.

The importance of fundamental research in influencing progress in the discovery of new therapeutic agents, was fully demonstrated in the physiological, biochemical and pharmacological laboratories and the spacious, well-equipped new organic chemistry research laboratories recently completed for use. Among the many operations shown, the large-scale manufacture of pure vitamins and of vitamin concentrates proved of particular interest.

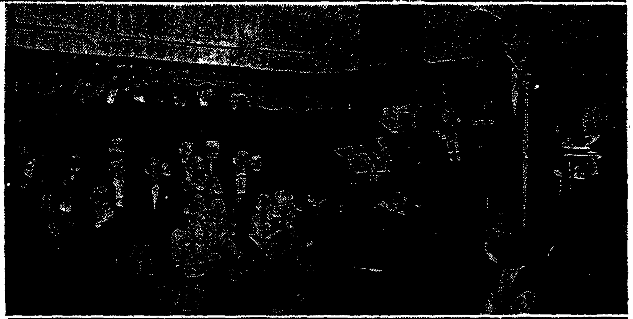
The complex apparatus and processes necessary in the preparation of the synthetic oestrogens, stilboestrol and dionoestrol attracted much attention.

Delegates subsequently lunched at the Café Royal at the invitation of the directors of The British Drug Houses, Ltd. Among the notable visitors present were Professor W. H. Mills, past president of the Society, Dr. H. H. Hatt (Australia), Dr. V. C. Barry (Eire), Professor T. S. Wheeler (Eire), Dr. and Mrs. Krishna (India), Professor R. Delaby (France)), Dr. and Mrs. H. G. H. Erdtman (Sweden), and Professor O. Achmatowicz (Poland). Professor W. H. Mills, on behalf of the Chemical Society, thanked the directors of the company for the opportunity to visit the plant and for their hospitality, while Mr. F. C. Oscar Shaw, managing director of B.D.H., replied.

Kodak Works Tour

A party of 32 delegates to the Centenary Celebrations of the Chemical Society visited the Kodak Research Laboratories on Wednesday, July 16. The party included Dr. C. W. Shoppee, member of Council for the Society, who proposed the vote of thanks, and Mr. R. M. Winter, Controller of Research for I.C.I.

Mr. E. R. Davies, director of research, Kodak laboratories, welcomed the visitors in the conference room where were exhibited colour prints, transparencies, graticules, templates, publications, etc. After a short talk by Dr. H. Baines on the chemical work of the laboratory (with special reference to the basic principles of emulsion making), the party made a tour of the laboratories seeing the tricolorimeter, shutter testing machine, developer analysis, sensitometry, continuous processing machine, the works laboratory (silver analysis) and finally, the Kodak museum.



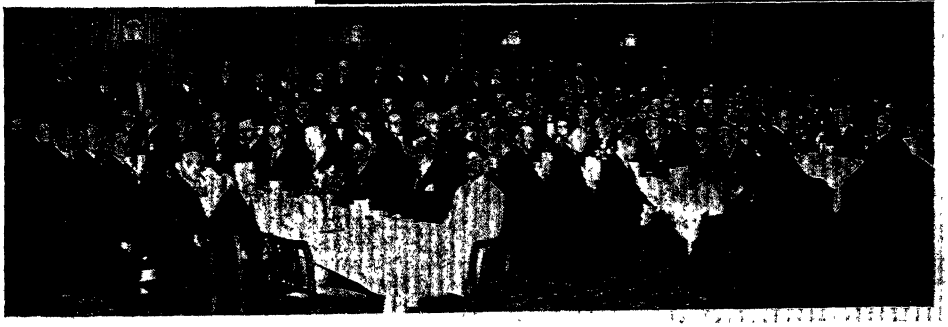
Happy scenes at the I.C.I. Dance and Cabaret:

Top: The dance floor.

Centre (top): An entertainer amusing guests with dancing dolls.

Centre (below): Guests watching the cabaret.

Following a visit to the laboratories of British Drug Houses, Ltd., a party of the delegates to the International Congress of Pure and Applied Chemistry was entertained to lunch at the Connaught Rooms by the directors of B.D.H. The photograph (below) shows the guests at lunch.



INTERNATIONAL CHEMISTS IN COUNCIL

CONGRESS AND UNION CONFERENCE OPEN

"IN the name of my country and on behalf of the Executive Committee of the Congress I extend to all of you a very warm welcome." With those words Lord Leverhulme, as president, opened the 11th International Congress of Pure and Applied Chemistry at the Central Hall, Westminster, last week.

Viscount Leverhulme

After expressing his appreciation of the honour done to him in naming him president of the congress and of the delegates' attendance, notwithstanding the difficulties of international travel, Lord Leverhulme said: "Another international chemical congress is long overdue and, but for the war, this congress would have been held in London no doubt in 1941. There is thus a great leeway to be made up, and to the need for this congress the number of papers—some 1500—and their quality and importance amply testify.

"It is out of these things, and from the sectional meetings, and also from the addresses of distinguished men of science that the results of this meeting will emerge and bear fruit for the future. But we must not forget another factor—the revival of old friendships and the forming of new ones, and the great value to be derived from all those informal contacts, discussions and interchanges of views and experiences which take place outside the formal setting of the conference hall

"The part that chemistry plays in the life of man is now more clearly seen than ever, and, while I do not believe that chemistry can explain the whole of man, it is most certainly true to say that it is to chemistry that we now turn for an explanation of most of our bodily processes and of the brain's reaction to outward influences and stimuli; phenomena which at one time did not seem to have any connection with chemistry at all.

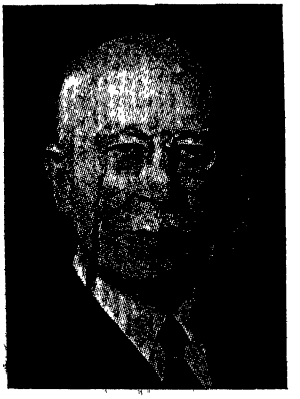
"While chemistry has advanced our understanding of our bodies, it has at the same time enormously increased our power to heal them—or to help our bodies to heal themselves—and chemistry has thus prolonged life and added to the happiness of mankind through the alleviation of anxiety and pain.

"In the inorganic sphere the progress has been no less remarkable. A man must indeed be devoid of imagination who does not see in this congress an immense opportunity for helping civilisation still further."

International Union of Chemistry

The ceremony of opening the 14th Conference of the International Union of Chemistry, which followed, was performed by Professor Marston T. Bogert, president of the conference, who is representing here the U.S. National Research Council, the National Academy of Science, the American Institute of Chemists and Columbia University of the City of New York. Having congratulated the president and officers of the International Congress on the success which had crowned their preparatory work, Professor Bogert described the ready co-operation which had aided the revival of the work of the International Union.

"Sir Robert Robinson," he recalled, "visited the United States during the summer of 1945 on a scientific mission for his country, and in the course of that visit we met in Boston to exchange views on the future of the International Union of Chemistry and to plan how best to conduct the campaign for its rehabilitation. Sir Robert reported the apparently unanimous opinion of the chemists then present in London that the attempt should be made



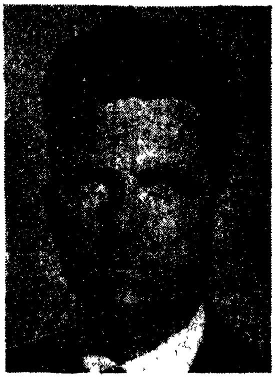
Professor M. T. Bogert

(*Continued on p.* 131)

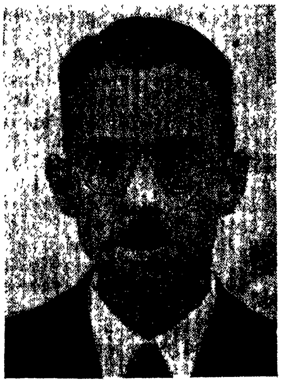
PERSONALITIES AT THE CHEMICAL CONGRESS

Dr. A. Goldberg (U.S.A.).

Dr. G. Batta (Prof. of Ind. Chem., Léige University).

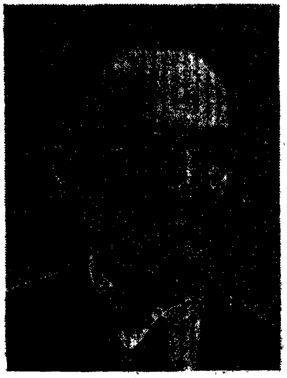


Dr. R. Houwink (Holland).



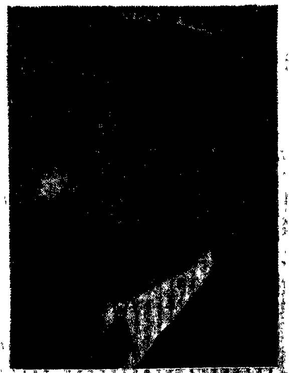
Dr. W. Mitchell (Sec., Section 14).

Dr. D. Faulkner (U.K.—"Elastomers and Plastics").



Dr. J. Walker (Medical Research Council).

Dr. C. J. Koenig (U.S.A.—Director of Research, American Nephalene, Ltd.)



Prof. von Euler (President, Swedish National Committee for Chemistry).

(*Continued from p.* 111)

and held a class in chemistry, receiving a grant of £11 a year for the purpose.

Some of the great trends of chemistry in the next 20 years are reflected in our *Journal*. One of the most splendid phenomena had been the flowering of the great tree of organic chemistry.

In 1901 the death of Queen Victoria symbolised the end of an epoch. It was a time of intellectuual and social unrest and uncertainty: agriculture had collapsed, industrial struggles had acquired a new bitterness.

By this time the health of chemistry in Britain was much more robust, and schools of research were gradually coming into being in many of the universities. Tilden in 1904 told the Chemical Society that he considered the science to be flourishing. A glance at the *Journal* of 1901 certainly shows a great variety of activities which range over investigations on alkaloids, bacterial actions, optically active nitrogen compounds, absorption spectra and the synthesis of methane.

The transformation by 1921 was colossal indeed in every aspect of life: profound political changes, an unprecedented degree of mechanism and all the febrile aftermath of what then counted as the greatest war in history.

The Chemist's War

The war of 1914-1918 had brought profound changes to British chemistry. It has often been called the chemist's war. Unprecedented needs of explosives, chemical warfare agents and other products of industry had forced an improvised expansion, which, by a fortunate dispensation of providence, gradually merged into an orderly and continued evolution.

The raising of the curtain for the last time on the actual centenary date of 1941 disclosed a scene of chaos and destruction. Two decades of fruitful progress seem to have been brought to a tragic end. In some ways the two decades had been among the most productive that chemistry had known. Modern theories of valency had brought an immense clarification into the whole system of inorganic chemistry: the subtleties of organic behaviour had been penetrated, and the intimate mechanism of chemical changes in general stood largely revealed. There had been a powerful cross fertilisation of chemistry with physics and mathematics. And on the human side the developments were no less vigorous.

One of the unmistakable trends of the past century has been the successive decline of different aspects of individualism: the independent craftsman, the aristocratic politician, the empire-building explorer all departed from the scene. In science a similar trend has been visible though at a lag of several decades. At the time of our foundation the stage is dominated by the amateur, whether a Cavendish or a Faraday: later the individual is more and more frequently dependent upon the university or technical college, small and independent but none the less a community. Then the great research associations appear and the State subsidy becomes indispensable. Two great wars intensified and accelerated the collective process in the world of science until to-day we are faced with the problems presented by vast industrial research laboratories and by State enterprises undertaking work which is inconceivable without the co-ordinated efforts of hundreds of men of science. The great question is what is to be the fate of the individual in the world which has emerged.

In this matter something of an idealogical battle has been engaged, and the question is one of moment for the future of an independent scientific society.

Individualism and Controls

Complete individualism means chaos, which is only given form by something analogous to an energy factor—by State compulsion, or by powerful emotional forces. If any of these controls are applied too vigorously the result is order indeed but the order of utter stagnation. Just as nature strikes her subtle balance, so it must be here. Nothing is less fruitful than doctrinaire argument about freedom and planning. The vast achievements of military regimentation in wartime have been cited as examples for peace, but in this it is forgotten that results in limited spheres have had to be bought with an utter disregard of cost, whether of money, happiness or life.

A hundred years ago we saw an individualist society faced with the task of controlling the industrial revolution: at the beginning of a new century we face a task which seems even greater, that of preventing an organised society from turning individuals into slaves. The problem involves the relation of the State to science, of the industries to the universities, the organisation of research laboratories, and indeed the relation of every man of science to the laboratory in which he works and to the science as a whole.

Those who call themselves planners are often, I think, not conscious enough of the art and effort involved in large scale action. Even with the most admirable motives and goals operative complexity often brings frustration. There is need for a complete new science, a kind of biological and psychological statistical mechanics to clarify those matters.

One very welcome sign of the past few years has been the increasing number of scientific papers published from the chemical

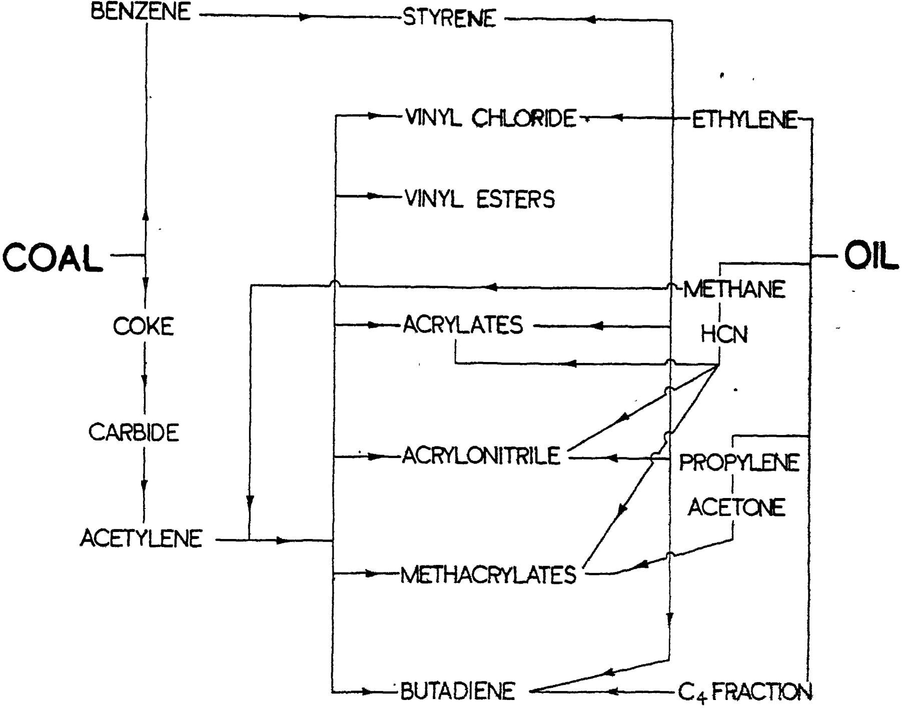
(*Continued on p.* 131)

St. Andrews Symposium

VINYL COMPOUNDS

By J. H. BROWN

THE compounds with which I shall be dealing to-day are certain mono- and asymmetrically di-substituted ethylenes, which have assumed considerable importance in recent years, in consequence of the fact that they may be polymerised to synthetic resins which are finding ever-increasing applications. I shall endeavour to deal, as far as possible in the time at my disposal, with their synthesis and technical production.

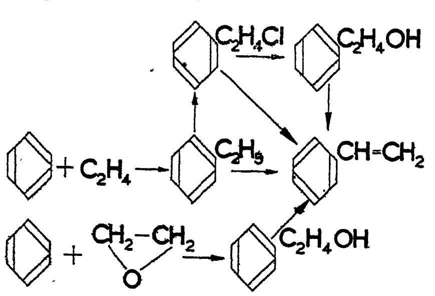


Vinyl Compounds from Coal and Oil

For the synthesis of these compounds, three fundamental synthetic methods exist. The first consists in the elimination of two radicals from adjacent carbon atoms. One of these radicals is usually hydrogen, and the other may be hydrogen, halogen, hydroxyl, carboxyl, amino, etc. Many examples will be brought out later. The second method consists of the addition of HX to acetylene. This is a most useful method, and the addend may consist, for example, of a halogen acid, HCN, alcohol, or an organic acid. The third method consists in taking a compound already possessing the vinyl structure, and modifying the substituent groups.

Styrene

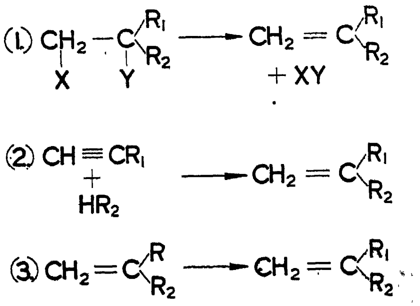
The first compound with which I wish to deal is styrene. This is an aromatic hydrocarbon, boiling point 146°. It has been known since 1831, when it was obtained by Benastro by the distillation of gum storax. Production on a large scale has been developed only in the last fifteen years, and latterly has been greatly accelerated by the synthetic rubber programme. Many thousands of tons are manufactured annually in both the United States and Germany. The quantity of this material obtained in coal tar distillation is below the world requirement, and further, the compound is difficult to isolate in a state of purity. For all practical routes, the raw materials are benzene and ethylene, to give different saturated derivatives, from which styrene is obtained by the use of the first of the general methods for the synthesis of vinyl compounds. In passing, it may be mentioned that many attempts have been made to synthesise styrene by the addition of benzene to acetylene, but these have met with no success. Ethylene and benzene react in the presence of aluminium chloride, to give ethyl benzene. This may be chlorinated and the chloroethyl benzene dehydrohalogenated to give styrene, or it may be hydrolysed to the alcohol and this dehydrated. Alternatively, the alcohol may be produced from benzene and ethylene oxide.



Synthesis of Styrene

A more direct process has, however, been developed. It is the dehydrogenation of ethyl benzene, and appears to be that most widely used for the production of this compound. In this process benzene and ethylene are fed to the base of an enamel-lined tower, into which aluminium chloride is supplied at the top, the temperature being maintained at about 104°C. A 50 per cent excess of ethylene is used. The reaction product passes to a separator whence some aluminium chloride is returned to the reactor. After washing with water and caustic soda, and drying with solid potassium hydroxide, the product is distilled in a set of continuous stills, and the pure material fed directly to the dehydrogenation vessel, where it is contacted with a catalyst consisting of a mixture of zinc, aluminium, calcium and magnesium oxides, at a temperature of 650°C. Gases formed in the reaction are purged off, while the liquid product is separated into an aqueous layer which is discarded, and a hydrocarbon layer, which is refined in a series of five stills, whence benzene, ethyl benzene, etc., are recycled to appropriate points in the plant. This is just one example of the care necessary to get pure products which will give satisfactory and reproducible results on polymerisation. Each of these five columns was of the order of 60 ft. high and contained 30-40 theoretical plates.

I should next like to discuss the production of vinyl chloride. This compound, a gas, condensing to a liquid at - 12°C., has been known for over a hundred years, but again only during the last two decades has it been produced in quantity. Annual world production now exceeds 50,000 tons. The available methods of synthesis are simple and restricted in number. All start from acetylene or ethylene as raw materials. From ethylene, vinyl chloride may be made either by direct chlorination at elevated temperatures under which condition substitution becomes the prominent reaction, or by a two-stage process involving normal addition chlorination to ethylene dichloride, and subsequent elimination of HCl from the latter, either by pyrolysis or by the action of alkalis. While some commercial production may be achieved by these means, there is little doubt that in the main, most vinyl chloride is manufactured by the direct addition of HCl to acetylene, which is an easy and convenient process, conversions of close on 100 per cent being attainable, with no undesirable side reactions or by-products presenting difficulties in separation.


(1) $CH_2-C(Y)\langle^{R_1}_{R_2}$ with X on CH_2 → $CH_2=C\langle^{R_1}_{R_2}$ + XY
(2) $CH\equiv CR_1$ + HR_2 → $CH_2=C\langle^{R_1}_{R_2}$
(3) $CH_2=C\langle^{R}_{R_2}$ → $CH_2=C\langle^{R_1}_{R_2}$

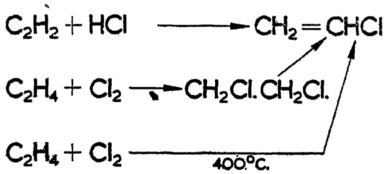
Formation of Vinyl Compounds

Vinyl Chloride Plant

In a typical plant for this process acetylene is cooled, dried and metred and HCl also metred to a mixer from which the mixed gases enter the reactor where they are contacted with a catalyst consisting of mercury chloride deposited on active charcoal. The temperature is controlled to a maximum of 200°C. to prevent excessive volatilisation of mercury, either by oil circulation or by water boiling under the appropriate pressure. These reactors are of multi-tubular construction, to permit dissipation of the large amount of heat evolved. Catalyst life varies from days to months, and is dependent on the rate of throughput, and on the purity of the incoming acetylene. The gases leavng the convertor are scrubbed by water and aqueous alkali to remove HCl, and the product isolated by continuous distillation in two stills operating at atmospheric pressure. The first of these separates out a small amount of ethylidene chloride at the base, while the second removes acetylene as head product along with a small amount of vinyl chloride. The product is, of course, obtained from the base of the second still.

Vinyl Esters

Although I shall deal now more specifically with vinyl acetate, it should be remembered that most of what I have to say may be applied by analogy to other vinyl esters. Compared with the two previous compounds, vinyl acetate is a relatively recent discovery, being first made by Klatte in 1912, and polymerised by him in 1917. Since its production is based exclusively on acetylene as a raw material, it is not surprising to find that the material was first developed in Canada and the United States, where plentiful water power made adequate supplies of carbide available, and where it has been produced in quantity since 1920. Present world production exceeds 50,000 tons/annum, but I am not aware of its commercial production in this country. The compound is produced exclusively by the addition of the acid to acetylene, but two important variations of the process appear to have been used to approximately equal extents.



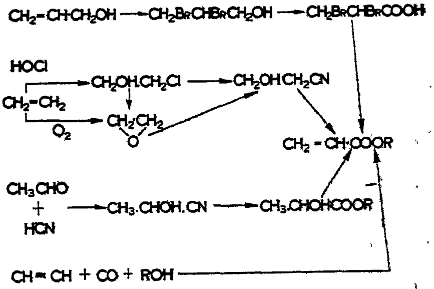
Synthesis of Vinyl Chloride

North American production seems to be based mainly on a liquid phase reaction, in which acetylene is passed into a stirred reactor, fed with acetic acid containing mercuric sulphate as a catalyst. The temperature must be controlled to below 30° C. to avoid excessive formation of ethylidene diacetate. The absorption is not complete, and the exit acetylene is cooled to remove the vinyl acetate, and recycled. The condensate is distilled and the acetic acid recovered is recycled to the process. The vinyl acetate is further refined by distillation and so is the by-product ethylidene diacetate. The mercury catalyst loses activity and is renewed either periodically or continuously. It is claimed that up to 100 lb. of vinyl acetate may be produced per lb. of mercury used.

In Germany, on the other hand, a vapour phase process, operating at a relatively high temperature, has been developed. Acetylene and acetic acid vapours are preheated to 170-200° C. in a series of heat exchangers, and the gases passed to a convertor containing a catalyst of active carbon impregnated with 70 per cent of its weight of zinc chloride. The convertor is again of shell and tube construction, to allow for the heat removal, the temperature being maintained at around 200° C. Catalyst life varies from 6 weeks to 6 months, according to the output, and the best conversion is 30 per cent of acetic acid and 15 per cent of acetylene. The exit gases pass *via* heat exchangers to the condenser system, and the acetylene is recycled. The condensate, consisting of 40 per cent vinyl acetate and 60 per cent acetic acid, passes to the centre of a fractionating column from the base of which acetic acid is recycled. The 97 per cent vinyl acetate coming off overhead, goes to the second column in which the aldehyde is removed at the head, while vinyl acetate leaves the base and is refined in a final still. Despite the low conversions, recycling of all unreacted materials leads to an overall yield of 90-95 per cent.

Acrylic Acid and Esters

Acrylic acid and its esters represent another series of vinyl compounds which has been known for a very long time. Its subsequent development is largely due to the work of Rohm who first polymerised the acid in 1912, and proposed the use of the polymeric esters in lacquers in 1915. There are many possible routes to these compounds. First we have the old route, starting from glycerol, which was converted to allyl alcohol by well-known methods, and thus into acrylic acid by the steps shown. More recent and more practicable methods use ethylene as starting material. This is converted to ethylene cyanohydrin by one of the two routes shown, and hydrolysis of the nitrile group accompanied by dehydration leads again to acrylic acid. A superficially attractive route is that from acetaldehyde *via* the cyanohydrin, but the latter is not readily converted to acrylate and circuitous routes are necessary to accomplish this step. Finally, it has recently been learned that Reppe, working for the I.G. in Germany, has solved the problem of the addition of CO and water to acetylene, to



Synthesis of Acrylic Esters

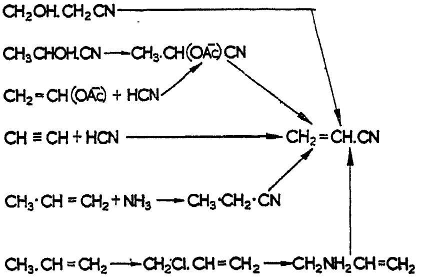
give acrylic acid directly. This interesting reaction has been accomplished by the use of nickel carbonyl in conjunction with acetylene under pressure.

Of these processes, that most widely used in technical practice are those based on ethylene. The processes, by which ethylene chlorohydrin is made and converted to ethylene oxide, are too well-known to require description here, though it is interesting to note the possibility of oxidising ethylene directly to ethylene oxide, as has been done in Germany. Ethylene oxide is converted to the cyanohydrin by reaction with HCN, in the presence of lime at room temperature. Yields are good, and the product is used without purification in the further stages of the process. The conversion of the cyanohydrin into acrylates is accomplished by reaction with sulphuric acid and the apppropriate alcohol. The reactor consists of a lead-lined pot, surmounted by a tile-lined tower. Methanol is fed to the pot and 78 per cent sulphuric acid and cyanohydrin enter the top of the tower. The temperature of the pot is 150°C. The vapours pass through a dephlegmator at 78°C. and then into a second vessel containing water at 95°C. The vapours then pass up a column, down which water at 75°C. is fed. This washes out methanol and the distillate from this tower is 80 per cent methyl acrylate. This is washed again in a similar vessel, giving 90 per cent ester. The condensate from the dephlegmator of this tower is separated into an upper layer of 90-95 per cent ester, while the aqueous layer is returned to the pot. The two products are combined and finally purified by batch distillation.

Acrylonitryle

There have been rapid developments in connection with acrylonitrile recently, as it is a constituent of some types of synthetic rubber, and because the polymer can be drawn into fibres. Also the compound is extremely reactive, and is finding increasing application as a synthetic intermediate. As would be expected, the methods of synthesis bear some relation to those used for the synthesis of the acrylates, though in addition, some special methods are available. Thus, ethylene cyanhydrin and acetaldehyde cyanhydrin can, by appropriate measures, be dehydrated to yield acrylonitrile. The production of the latter intermediate from vinyl acetate is interesting. Of the methods not related to acrylate synthesis, the most important is the direct addition of HCN to acetylene, but recently, other routes based on propylene as a raw material, have received some consideration. The latter may be aminated directly to yield, as one constituent of a complex mixture, proprionitrile, or alternatively, converted to allyl amine *via* allyl chloride. Acrylonitrile is formed from either of these two intermediates by dehydrogenation.

For the industrial manufacture of this compound, two methods are of equal importance, that from ethylene cyanhydrin and the direct addition process. In the former, cyanohydrin is produced by one of the methods already described when dealing with the acrylates, and a number of alternatives have been proposed for its dehydration to acrylonitrile. In early work, phosphorus pentoxide was used, but this was not very practicable. Catalytic methods are now preferred, tin deposited on charcoal, or conventional dehydration catalysts such as alumina having been used, at temperatures in the range 225-500° C.

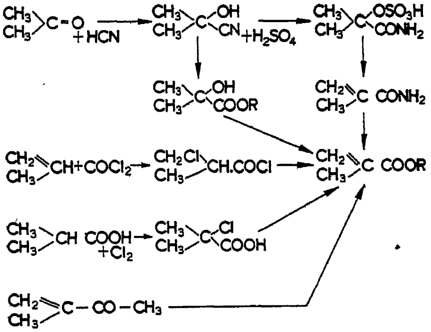

CH₂OH.CH₂CN
CH₃CHOH.CN → CH₃.CH(OAc)CN
CH₂=CH(OAc) + HCN
CH ≡ CH + HCN → CH₂=CH.CN
CH₃·CH = CH₂ + NH₃ → CH₃·CH₂·CN
CH₃.CH = CH₂ → CH₂Cl.CH = CH₂ → CH₂NH₂CH = CH₂

Synthesis of Acrylonitrile

The direct process appears to have been that most widely worked in Germany. Purified make-up acetylene is mixed with recycled acetylene and enters a reactor containing an acid solution of cuprous ammonium chloride. HCN is admitted at a point half-way up the reactor. A ten-fold excess of acetylene is present in the circulating gases, though the make-up is on an equimolar basis. The exit gases from the reactor are scrubbed with water in a tower, and are recycled, the purge being controlled to keep the content of vinyl acetylene at not more than 15 per cent. The weak solution of acrylonitrile so formed, is stripped with steam in a second tower. The issuing vapours are condensed, and the condensate separated into two layers, of which the lower aqueous layer is returned to the column, while the upper organic layer passes on to the still system. Due to the complicated mixture to be separated—there are present (in addition to acrylonitrile), acetaldehyde, HCN, monovinyl acetylene, lactonitrile, divinyl acetylene and others—the still system is rather complicated. The first still removes acetylene and other volatile impurities. Water is removed by an ingenious system of sidestream withdrawal, and continuous separation. Acrylonitrile, with high boiling impurities, flows from the base of this still to a second still, where pure acrylonitrile is taken as head product, and the high boilers concentrated at the base of this still to a second still, where pure acrylonitrile is taken as head product, and the high boilers concentrated at the base, whence they pass to a third still, running under reduced pressure, to strip out the last traces of acrylonitrile from the high boilers. This acrylonitrile is contaminated with HCN arising from deposition of the lacto-nitrile and is recycled to the first still.

Methacrylates

We now come to another important class of vinyl compounds in methacrylic acid and its esters. Here again, the past few years have seen an enormous increase in the manufacturing capacity for this material, an increase which has arisen mainly from the use of the glass-clear methyl methacrylate polymer in aircraft. These compounds are relatively inaccessible, and a variety of round-about methods have been proposed for their synthesis. Most of these are impracticable for large scale operations, either on account of the unavailability of the intermediates, or else because the processes give poor yields. Such are the processes *via* hydroxy-isobutyric acid, *via* isobutyric acid, from propylene, by the action of phosgene, or by the oxidation of isopropenyl ketones. The only method used in large scale manufacture is that from acetone, in which the cyanohydrin is reacted with sulphuric acid, to yield methacrylamide, from which the free acid or esters are obtained by hydrolysis and esterification.



Synthesis of Methacrylic Esters

The process for methyl ester manufacture is carried out batchwise. In the first step, HCN is added to acetone, under the influence of an alkaline catalyst, in reactors equipped with brine cooling, to maintain a temperature below 40° C. When addition is complete, the temperature is lowered, and the equilibrium fixed by acidification at - 15 to - 20° C. The cyanohydrin so prepared is added in the next stage to sulphuric acid, cooling again being applied to maintain the temperature at around 80° C. The amide sulphate which is so formed is then heated to a temperature of 120° C.-150° C., when sulphuric acid is split off, yielding methacrylamide. The crude amide so formed, is now esterified by refluxing with water and methanol, either in the same vessel, or in a separate vessel. The mixture is then steam distilled and the distillate washed with brine or water, and distilled batchwise at reduced pressure. Stabilisers such as hydroquinone may be added to the column to prevent polymerisation.

Butadiene

No discussion of vinyl compounds, would, I think, be complete without some reference to one compound, production of which, far exceeds the total of all other plastic intermediates, and in fact, probably exceeds 1,000,000 tons annually. I refer, of course, to divinyl, better known as butadiene. The tremendous importance of this compound is evidenced by the enormous amount of effort which has been devoted to its synthesis and is reflected in the large number of practical processes. An early process started from benzene or phenol, which were converted by appropriate steps into cyclohexene which on pyrolysis yielded butadiene and ethylene. These rather clumsy methods have given way to others in recent years, though they have the great advantage of yielding a crude butadiene which does not present great difficulties in purification. Several alternative processes use alcohol as a raw material. Russian and Polish workers claim the direct conversion into butadiene using catalysts, details of which have not been disclosed. American workers have been unable to duplicate these results. Alternatively, ethanol may be converted to aldehyde by oxidation or by dehydrogenation over copper catalysts, and this again may be converted into butadiene by two alternative processes. In one of these aldehyde is condensed to aldol, this reduced to 2.3-butylene glycol which is dehydrated to give butadiene. In the alternative process aldehyde is converted to crotonaldehyde and this is reacted with ethanol to give butadiene, acetaldehyde and water. By the use of catalysts consisting of tantalum oxide on silica gel, the latter two reactions may be caused to proceed simultaneously, this in effect providing a process for the conversion of alcohol into butadiene.

Yet another series of processes starts from acetylene as raw material. This may be converted into aldehyde, the rest of the process being as already discussed, it may be polymerised to vinyl acetylene which on hydrogenation yields butadene, or in the recently disclosed German process, may be reacted with formaldehyde under pressure, in the presence of a catalyst of cuprous acetylide to give butinedol, which is reduced to tetramethylene glycol, and this in turn dehydrated to yield butadiene. Butyl alcohol, obtained from fermentation processes, has also been used as a raw material. This is reacted in turn with HCl and chlorine to give a mixture of dichlorobutanes, which is converted by dehydrochlorination into butadiene.

By far the most important source of butadiene, however, is the C_4 fraction obtained from oil cracking processes. In come cases, special modifications have been made to the cracking process to increase the amount of butadiene formed directly, but even so, this is inadequate, amounting to not more than one-sixth of the American production. The greater part of the butadiene (over half the American production) is produced from the other C_4 hydrocarbons, by subsequent processing. Thus, butane is dehydrogenated to butene and this may be further dehydrogenated to give butadiene directly, or alternatively may be chlorinated from butadiene, obtained by dehydrochlorination of the resulting dichloride.

In conclusion, it is appropriate to return to the central theme of this meeting the dependence of modern synthetic chemistry on oil and coal. Many examples of this dependence have already been quoted. Considering the compounds purified from coal, it is noteworthy that, with the exception of aromatic derivatives, all routes to the vinyl compounds with which I have been dealing, pass through the key intermediate-acetylene —*via* coke and carbide. In the case of oil, a wider range of initial steps is used, since all the hydrocarbon fractions from C_1 toC_4 have been used directly or indirectly in the synthesis of vinyl compounds. Most of the chemistry we have been discussing belongs to the last twenty years, and it seems not unreasonable to suppose that we have much to discover in this rapidly growing field. The plastics chemist will become interested in new vinyl intermediates, and I am confident it will not be beyond the skill of the organic, synthetic and technical chemists to devise sound, economical routes to the synthesis of these new compounds. When they do, however, it is reasonably certain that the basic raw materials will be oil or coal.

Tin Stocks in May

A small reduction during May in U.K. tin stocks held by the Government is shown in figures just issued by the Ministry of Supply. Ministry stocks of 7021 tons at the beginning of May had fallen to 6763 tons at the end of the month. Production represented 2529 tons, 357 tons went for export and 2430 tons were distributed to firms in this country, whose stocks on May 31 are estimated to have been approximately 3815 tons, an increase of about 89 tons.

SIR WALLACE AKERS ON ATOMIC ENERGY

WRITING in the July issue of the I.C.I. *Magazine*, on the utilisation of atomic energy, Sir Wallace Akers, research director of I.C.I., says that it seems likely that there will be an atomic power plant working in America by 1949, while within five to ten years we may expect to see atomic power stations beginning to take their place alongside coal and oil-fired electrical generating plants. What the cost of electricity from an atomic power station will be, is, he says, a matter of guesswork, although it is reasonable to suppose that the cost of atomic power will be brought down until it is competitive with the cost of coal-generated power.

Sir Wallace Akers describes how thorium could be utilised in an atomic pile. This element resembles U238 in its ability to capture a neutron without undergoing fission, and forms an unstable isotope which then loses two electrons, by conversion of two neutrons in the nucleus to protons. The new element has 92 protons and is therefore, a new isotope of uranium with atomic weight 233, *i.e.*, U233.

This artificially made istope is fissile, like U235, by fast and slow neutrons. Hence the rather scarce uranium could be supplemented by the much commoner thorium by converting this into U233, which can be done by placing thorium or some compound of it, in the outer layer of a working pile so as to catch some of the neutrons which would otherwise escape. The U233 could be separated from the unchanged thorium by chemical methods. It is possible, thinks Sir Wallace, that a self-sustaining U233-thorium pile could be built. If this is practicable then, having once made some U233 from thorium in a uranium pile, energy could be generated and maintained, using only thorium as the raw material.

£14,000 SAVED ON WAR STOCK

SUCCESSFUL salvage at the Government depot at Bishopton, Renfrew, of a surplus of 10,000 tons of sulphonic acid mixture, used by the Navy to lay smoke screens, has saved an expenditure of some £10,000 in disposal costs. The chemical was to have been dumped in the sea at a cost of £10 per ton. The recovery of sulphuric acid for agricultural fertilisers and of hydrochloric acid for industrial purposes was approved and a method achieved whereby the Bishopton staff, under Mr. H. Sellick, completed the salvage of the mixture. Profit on the acids alone was some £1000 while empty drums realised £3000 per 1000 drums.

OXYGEN PRODUCTION IN THE U.S.A.

From our Peripatetic U.S. Correspondent.

IT is impossible to go very far in the chemical and metallurgical industries in the U.S.A. at the present time without hearing discussions about " tonnage oxygen." The immediate query arises as to the actual prospects of making oxygen available in large quantities and at cheap rates for various processes. The answer to that question may be sought in one of two main fields—in the old-established oxygen producers or in the newcomers to this industry. A rather interesting conflict of interests has arisen in this connection. On the one hand the old-established oxygen producers appear to be adhering to the policy of maintaining the manufacture of oxygen in their own hands and continuing the lucrative business of selling liquid oxygen in large tank car lots. For many consumers, both actual and potential, this represents the most convenient arrangement, although the price of the product is high. With a minimum figure of about $2 per 1000 cu. ft. for large deliveries, the prices of liquid oxygen are comparable with those prevailing in Britain.

Important Newcomers

As a result of the extensive work done in perfecting both portable and static oxygen plants during the war, a great deal of general engineering knowledge of the plants and processes of manufacture has been fairly widely disseminated. In consequence, there are a number of important newcomers to the oxygen field, whose interests are mainly in the engineering side of the industry. Such firms are primarily concerned with the manufacture of oxygen plants intended for sale to the various industries using oxygen. These newcomers to the field are offering a very wide range of plants ranging from comparatively small units with capacities of 200 cu. ft. per hour up to the gigantic new plant now under construction at Brownsville, Texas, with a rated capacity of 48,000,000 cu. ft. or 2000 tons per day. The primary function of this plant is to provide oxygen for the controlled combustion of natural gas in a reaction of the Fischer-Tropsch type to produce petrols, diesel oils, lubricating oils and waxes, with unsaturated hydrocarbons as by-products. In a plant of such magnitude —the rated capacity of natural gas to be processed is 66,000,000 cu. ft. per day—a very large oxygen plant integrated completely with the process is an essential.

The steel industry is also an extremely important large-scale consumer of oxygen. Very large quantities are used daily for various processes, and a vast potential market may be found if some of the new experiments being carried out in the open-hearth process fulfil their initial indications. In many of the processes in the steel industry the demand is intermittent or is characterised by the occurrence of decided "peaks" in the demand curve. Under these conditions the adoption of an integrated plant may not prove quite so attractive. These constitute the main fields of development of the future—processes characterised by a relatively steady demand for oxygen over the whole 24 hours and, on the other hand, those fields where the demand is intermittent. In the first case the installation of integrated plants appears the most reasonable solution, and in this field the newcomers to the oxygen business appear to be progressing favourably. Rivalry is rather keener in the second field and the course of future developments is rather difficult to foretell. An interesting pointer to future developments is furnished by the very recent announcement that the Linde Company of the U.S.A. has opened at Tonawanda, N.Y., a plant with a rated capacity of 200 tons or 4,800,000 cu. ft. of oxygen per day. This plant is only a few miles from Niagara Falls, N.Y., the centre of a very large and complex network of chemical industries. For several years past the Union Carbide and Chemical Company, of which the Linde Company is a wholly-owned subsidiary, have been engaged in the manufacture of calcium carbide and supplying the acetylene by pipe-line to the various chemical manufacturers in the neighbourhood. It appears a reasonable surmise that this new large-scale oxygen plant may develop along similar lines, supplying liquid oxygen in tank cars to certain consumers, while gaseous oxygen may eventually be piped to other consumers requiring larger or more continuous supplies.

Economics the Deciding Factor

In some respects such an arrangement offers distinct advantages to consumers such as the steel firms, who are not possessed of the technical staff and labour required to run such a plant. The deciding factor must be economics. If the prices charged by the firms supplying oxygen to the various firms by tank car or pipe-line are too far out of line with those eventually proved possible by the integrated plants, then what is at present a lucrative business will suffer a serious decline. The challenge to the engineering newcomers to the oxygen field is to perfect the development of oxygen plants with "push-button" control, capable of being operated for long continuous periods without much technical supervision. Experience gained during the war along these lines has proved of great value.

M-V's EXHIBITS

At the Chemical Society exhibition held in the Science Museum, London, S.W.7, last week the Metropolitan-Vickers Electrical Co., Ltd., demonstrated the company's work in the field of molecular distillation.

Molecular distillation permits heat-labile substances to be purified or separated at the lowest permissible temperatures, and also allows the partial separation of substances (*e.g.*, isotopes) of different molecular weight but similar vapour pressure.

Fats, waxes and petroleum derivatives are among the many substances that can be distilled in this manner. Vitamin A concentrates, which decompose in conventional apparatus, are produced commercially from fish liver oils by this process. In 1928, petroleum derivatives of high molecular weight were investigated in the Metropolitan Vickers Research Laboratories by C. R. Burch, who obtained various fractions which have extremely low vapour pressures at room temperature. They are widely used as diffusion pump fluids and as sealing media in high vacuum equipment and are known as the "Apiezon" range of low vapour-pressure products.

Another M-V exhibit was the short-path batch still used in the company's research laboratories by C. R. Burch in his original discovery of high vacuum distillation for the producton of low-pressure petroleum derivatives. The material to be treated is placed in the tray, the requisite vacuum produced, and the temperature of the tray raised progressively. The several fractions are then collected in turn in the glass test-tubes.

Anniversary

The 25th anniversary of the Coastwise Petroleum Company of Baltimore, Ohio, was celebrated on July 1. Beginning operations in 1922 by the assembling and storing of benzol, toluol, xylol and similar products in a small way, the company grew until in the years just before the war it was the major exporter of these chemicals. Millions of gallons of British coal-tar products found their way, during the war, to the company's plant at Goodhope, New Orleans, where they were fractionated. Recently exports to Europe of various chemicals in bulk have been resumed.

Official Notice

Oils and Fats

The Ministry of Food advises that no changes will be made in the prices of refined oils and imported edible animal fats allocated to primary wholesalers and large trade users during the eight-week period July 20, 1947, to September 13, 1947.

THREAT TO PENICILLIN PLANT

The penicillin factory operated by Glaxo Laboratories, Ltd., at Barnard Castle, Co. Durham, may have to be moved to another part of the country. This was stated by Sir Harry Jephcott, chairman of the company, at the Ministry of Health inquiry recently into the refusal by Barnard Castle Urban Council to deal with the factory's effluent of up to 25,000 gal. a day without an indemnity against damage which might be caused to the disposal works. Over 500 people are employed in the Glaxo fermentation factory, which cost £500,000 to build in January, 1946, and produces much of this country's penicillin. Glaxo Laboratories are now spending £20,000 a year to remove the effluent by tankers to the sea at West Hartlepool.

Small Rise in Coal Production

The average weekly output of deep-mined coal last month showed a small improvement on the figure for the last four five-day weeks in May and was fairly substantially larger than the corresponding figure in 1946. Average weekly output in June was 3,623,900 tons, against 3,516,800 tons weekly in May and 3,394,300 tons in June, 1946. These facts, and an increase of 2½ million tons in distributed stocks in June (compared with an increase of 1 million tons a year before) and a sustained rise in output per manshift to a little more than 1.8 tons, are the best features of the summary issued this week by the Ministry of Fuel. Less reassuring were evidences of rising absenteeism (to 5.84 per cent voluntary absentees, against 4.65 per cent in May) and a reduction in the rate of recruitment to the mines, the total mining force now numbering 717,500, compared with 714,600 in May.

New Recovery Plant Stops

Because an allocation of fuel is unobtainable, it is impossible to operate a £70,000 caustic soda recovery plant recently installed at a paper mill, to deal with foam which often floats down Manchester rivers. This was reported on July 15 to a meeting in Manchester of the Lancashire Rivers Board. With few exceptions, said a report to the committee, the bad "condition" of most rivers and streams in the area was not attributable to discharges within the Manchester boundary. "In proportion to its size, the Irwell and its tributaries are reputed to be draining one of the most highly industrialised areas in the world, with the result that there is no clear water at all in this river when it reaches Manchester."

Canadian Chemical Notes

From Our Canadian Correspondent

A PROJECT which is capable of revolutionising Canadian production of fertilisers has been broached in the Canadian Senate by Senator J. A. McDonald, former Nova Scotia Minister of Agriculture. The senator claims that the large phosphate deposits in the Saguenay district of Quebec could be transformed into soil fertiliser at a cost of $5 a ton, compared with the $14 which Canadians are currently paying for imported phosphates. Canada is expending over $10 million annually for imported fertilisers and the senator contends that the funds spent on import freight subsidies on these imports alone would have been sufficient to develop the Saguenay deposits, as well as others. Other large phosphate deposits have been found in New Brunswick and good quality potash in Saskatchewan. The sulphuric acid needed for the all-Canadian industry could be produced from a native calcium sulphate found in New Brunswick.

* * *

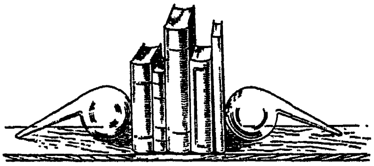
Shortage of three principal fertiliser elements—nitrogen, phosphorus and potassium—is adding to the world's hunger problem. Many of Europe's main fertiliser plants were destroyed by bombing and other sources in the United States and Canada were cut because the three main elements are also important ingredients of munitions. Canadian fertiliser plants fell 20 per cent short of the country's demands this year, Mr. G. S. Peart, fertiliser administrator for Canada, has announced. At the same time, output was at least twice as great as that of five years ago. Good food crop prices have brought increased demands for fertiliser from farmers. Had their needs been fulfilled, the output of canning crops alone would have been at least 3 per cent greater this year. Canada supplies more than enough nitrogen for her own needs, using only 20 per cent of her production domestically. About two-thirds of the country's phosphorus needs are also home-produced, but all potassium must be imported. The Dominion imports potassium and phosphorus from the United States and, two months ago, received also 6000 tons of potassium from the Russian zone of Germany and a shipment of phosphorus from Holland. European fertiliser prices, however, are too high in comparison with those of Canada and the United States, said Mr. Peart. Unless these prices come down before next spring, imports from Europe are considered unlikely.

* * *

Characteristic evidence of the growth of chemical industry in Canada is the $10 million building and expansion programme undertaken this year by Canadian Industries, Ltd. Mr. Irving R. Tait, chief engineer, has revealed that work is already under way on several of the 12 main projects located at Toronto, Windsor, Kingston, Hamilton and Nobel, in Ontario, and Shawinigan Falls and Brownsburg, in Quebec. Notwithstanding Canadian Construction Association records which state "building costs are nearly double the 1939 level and demands for both material and labour far exceed supply," it is expected that most of the programme, undertaken to meet consumer requirements, would be completed this year. The main construction drawback has been lack of steel resulting from production interruptions in the eastern United States. Bricks also are scarce. Details of the building programme are: Toronto: Newest of the company's paint plants will be the finishes works located on an eight-acre site on outskirts of Toronto. Groundwork was laid for the $2 million undertaking a year ago and paint production is expected to start this autumn.

* * *

Substantially increased sales of industrial alcohol have offset rising production costs, shareholders of Commercial Alcohols, Ltd., were told at the annual meeting of the company in Montreal. Output so far this year is well in advance of corresponding figures in 1946 and the annual total seems likely to be correspondingly larger. The limiting factor is the molasses supply which will not be sufficient for the rest of the year's programme for production of alcohol; grain will be imported to maintain continuous operation.—Canadian Industrial Alcohol Co., Ltd., of Montreal, intends to make a "special distribution" to shareholders out of $2,360,493 received from its subsidiary, Robert McNish & Co., Ltd. This amount, it is stated in a letter to shareholders, represents 60 per cent of the amount due from the Scottish subsidiary, and transfer of the funds has been approved by British authorities. As there are 1,111,916 shares outstanding, the amount involved represents over $2 per share. The exact amount to be distributed is not yet known. The announcement is made in a letter which shows earnings for the nine months ended May 31, 1947, were $1,094,823, or 98 cents per share against $819,306 or 75 cents in the like period of last year. Operating profit was $1,798,301 against $1,665,421, other income $365,979 against $182,414, and tax provision $980,688 against $943,629.



A CHEMIST'S BOOKSHELF

A Century of British Chemistry. By F. Sherwood Taylor. London: Longmans Green and Co., Ltd. 1947. Pp.35 + IV. 1s. 6d.

Paradoxically, among the most topical additions to the current book list is one concerned very largely with what was happening in chemistry upwards of 100 years ago. The explanation of the anomaly is, of course, the recent celebration of 106 years' work by the Chemical Society, with which the publication of "A Century of British Chemistry" coincided. It gives an excellent short survey of the work and reasoning which had produced such revolutionary results in chemistry and industry in the past 100 years and of the tenacious and adventurous minds which pioneered those paths. The authorship, by the curator of the Museum of the History of Science, Oxford, whose exceptionally wide aquaintance with his subject has been proved by previous publications on science history, and the co-operation of Professors C. N. Hinshelwood and N. V. Sidgwick, are sufficient evidence of the book's credentials.

Wood Pulp and Allied Products. By Julius Grant. London: Leonard Hill, Ltd. 1947. Pp. 300 + XII. 35s.

As a relief from repeated evidences of dwindling resources of essential raw materials, it is gratifying to turn to a material which abounds in vast areas of the earth and, given adequate means of collection, could supply almost all the essential requirements and many of the luxuries of civilisation. Timber, of which this writer has made a wide study in considerable detail in its uses as wood pulp, fills that description. By the co-operation of the chemist wood fibres had been made to perform virtually miracles of transmutation before war stopped the free exchange of information, while accelerating research in many countries to multiply the number of vital substances into which wood pulp can be converted and to improve the chemical and mechanical processes. In this second edition of the book which he first published in 1938, Mr. Grant has greatly enlarged the picture to include many more recent developments of the "cellulose age" and the addition to the title of "and Allied Products" is indicative of the recent further widening of the field of research of which he provides a valuable summary.

George Washington Carver. By Rackham Holt. London: Phoenix House, Ltd., 1947. Pp. VII + 304. 15s.

As a corollary to the dictum that "the proper study of mankind is man" we offer—with appropriate diffidence—the proposition that men of science themselves afford a very rewarding study for scientists. Equally, of course, there are plenty of laymen capable of entering to a very large extent into the spirit in which great scientists have gained their victories, even if they cannot fully appreciate the value of these achievements. And since laymen represent the big battalions at the libraries and bookshop counters many of the studies of scientists bear the "popular" label. Rackham Holt's book, which is 99 per cent about the man and 1 per cent about the scientist, is no exception. That George Washington Carver was a practical scientist of a high order is evidenced by the extremely competent analytical activities, illuminated by genius, by which he succeeded in producing 300 products from the American groundnut and more than 100 from the sweet potato. As a plant pathologist and general horticultural scientist in all branches his historical achievements released the American South from bondage to cotton and ruin from the boll weevil and conferred greater benefits than his country has received from any other horticultural scientist.

Recognition, in part, were the awards in 1923 of the Spingarn medal for distinguished service to agricultural chemistry and in 1939 of the Roosevelt medal for service to science. But his greatest reward was to know that he served his community, and not the least remarkable of his achievements was to resist to the end of his life all attempts to commercialise his discoveries. To have been born a negro slave, as George Washington Carver was, and to have wrested a scientific education and honours from the Deep South sounds like a fairy tale. His biographer tells the extraordinary story in that manner and romantically eludes much of the factual evidence upon which this man's great reputation was based.

U.S.S.R. Raw Materials for Czech Chemical Industry.—It is reported that representatives of the Czech chemical industry recently went to Moscow for the purpose of negotiating the supply of raw materials.

(*Continued from p.* 118)

to rebuild the union and we agreed to do what we could to bring this about."

"Progress at first was discouragingly slow because of the widespread ruin and disorganisation of so much of the world. It proved exceedingly difficult to discover in the case of many foreign chemists formerly active in the union whether they were alive or dead and, if alive, where they were living. In the course of this investigation, we learned that one of our former presidents of the union, Professor Ernst Cohen, of Holland, had been murdered by the Nazis in their infamous gas chamber at Oswiecim. Gradually we found out where to reach the surviving chemists we sought and, practically without exception, when approached they approved of what we were endeavouring to accomplish and rallied to our aid.

"I am very happy this morning to be able to tell you that what we started out to accomplish two years ago has largely been achieved. The International Union of Chemistry has been rebuilt and in many respects is stronger than ever. The chemists whose devoted and tireless service has made this possible are the members of our Comité d'Action and the presidents of our various international commissions. Above all, we owe it to Sir Robert Robinson, Sir Ian Heilbron and Dr. Leslie Lampitt in England; in France to Dr. Frederic Joliot, Nobel laureate, Haut Commissaire de l'energie atomique, and our efficient general secretary, Professor Raymond Delaby, president of the Société chimique de France; in Switzerland to Professor Emile Briner, president of the Conseil de la Chimie Suisse; and in Holland to Professor H. R. Kruyt, recently president of the International Council of Scientific Unions."

(*Continued from p.* 120)

industry. These are clear and welcome evidence that the leaders of that industry are showing understanding of the intellectual needs of the men who serve it. One can only hope that the whips of commercial secrecy will not be succeeded by the scorpions of military security.

Looking to the future of chemical research one can confidently foresee an era of great technical progress. The powerful organisations which will ensure this are already in operation. The relevant problems of pure science will also be explored on a scale which has hitherto been undreamt of. Such matters as thermodynamic and kinetic studies on polymers, biological studies on chemotherapeutic agents and scores of others could be cited to show how the approach is changing from the sporadic and the amateur to the thorough and the professional. All this leads to new knowledge of inestimable value, and in this field also progress seems assured.

This raises a practical question of the first magnitude, that of adequate facilities for meeting. I feel a little ashamed that on this great occasion we should receive our guests in alien halls.

Important as buildings may be, our publications are still more so, and in the eyes of posterity the Society of to-day will be judged more by the quality of the work which it publishes than by any other criterion. As the poets tell us the immortality conferred by black ink is greater than that of lofty pyramids or even brass eternal. It has been a sad economy which has lavished money upon so many objects while restricting the means of scientific publication. We must continue to fight this philistine policy and hope that it will pass, never to return.

(The full address will be published in the *Journal* of the Society.)

(*Continued from p.* 110)

100 years, would go on from strength to strength, serving this country and serving the world.

The president of the society, Professor C. N. Hinshelwood, responding, thanked the Prime Minister for the toast. The presence of the head of the Government on that occasion, he said, was a compliment which they all appreciated very much.

Chemistry, he remarked, was a very subtle art, where things were seldom what they seemed. Recalling the first chemical transformation which most of them had seen, he said a little bit of blue litmus paper was taken, something was done to it and it went red. Amid the laughter and applause which followed this, Professor Hinshelwood denied that there was any political implication in this chemical transformation because the litmus could go back just as quickly to the blue.

Society Pot-Bound

He referred to the Chemical Society in its rooms at Burlington House as being pot-bound and, with a sly dig at the Government, said the difficulty in getting extra accommodation was because so much space seemed to be occupied by a growth of a hardy cactus.

Dr. Hinshelwood concluded by saying that chemistry was a tree of knowledge, for good and evil. The powers that it conferred were mighty, and their control was a matter for the general conscience of mankind. We could not, as was sometimes done, blame the scientists for abuses, any more than we could blame, say, the editors of the Oxford English Dictionary for the use of a vocabulary which was supposed to occur near Billingsgate.

Sir Henry Tizard proposed the toast of "The Guests," which was replied to by Lord Samuel and Professor L. Ruzicka.

U.S. CARBON BLACKS

THE failure of rapidly increasing production of carbon black in the U.S.A. to match the expanding demand in 1946 is described in the statement recently issued by the U.S. Bureau of Mines. Carbon black production and sales were in record volumes in 1946, responding to larger demand from all classes of domestic consumers and for export.

Production of 1244 million lb. exceeded the 1945 record by 18 per cent but was below total sales, which expanded 24 per cent over 1945 to 1,269 lb.

As a result, producers' stocks of black declined to 76 million lb. on December 31, 1946, compared with 102 million lb. at the end of 1945. Stocks of contact (channel) type blacks declined throughout the year. Furnace type stocks were built up moderately in the second and third quarters but declined in the fourth quarter. Furnace black production gained 22 per cent over 1945 to 625 million lb. and was greater for the first time than that of contact type blacks—619 million lb.

As the quantity of natural gas consumed in carbon black manufacture increased only 11 per cent in 1946 to 478,349 million cu. ft., the average yield increased from 2.32 lb. of black per 1000 cu. ft. of gas used in 1945 to 2.44 lb. in 1946. The average value at the plants of gas used was 3.02 cents per 100 cu. ft. in 1946 and 2.28 cents in 1945.

Sales to rubber companies increased from 804 million lb. in 1945 to 941 million lb. in 1946 and record quantities of black were taken by ink and paint trades. Although exports of contact types were controlled, exports of all grades increased 56 per cent to the unprecedented total of 271 million lb.

The average value of carbon black at the plants increased from 4.02 cents per lb. in 1945 to 4.82 cents in 1946, as prices of the principal contact grades advanced.

A total of 60 plants operated in 1946, one more than in 1945. One channel plant in Texas did not produce and two new furnace plants (in Texas and Kansas) were put in production.

Chemical Engineering Refresher Course

Production of mononitrotoluenes from nitration-grade toluene (coal-tar origin), nitric acid and sulphuric acid, is to form the subject of a refresher course to be held in Manchester on September 15-17 under the auspices of the N.W. branch of the Institution of Chemical Engineers. The lecturing team, which will be led and co-ordinated by Mr. M. B. Donald, will consist of Mr. C. H. Bowden, Dr. J. M. Coulson, Dr. F. Rumford and Mr. F. A. Warner. Production of saleable products, and the treatment and disposal of the spent acid will be included in the scheme.

ARGENTINE STEEL CO.

THE Argentine Government is understood to have approved the creation of a National Steel Company, styled Sociedad Mixta Siderúrgica Argentina, with an authorised capital of 100 million pesos, of which 80 million would be provided by the State and the rest by public subscription. It is reported that the output of pig-iron from the existing blast furnace at Palpalá in the Province of Jujuy, which uses local mineral deposits, will be thereby increased, while the capacity of the new plant will be approximately 315,000 tons of steel billets per annum, employing imported as well as national supplies of raw material and fuel. It is understood that negotiations are in progress with U.S. interests regarding the installation of the plant, that the Pittsburgh Steel Foundry Corporation is to start construction of a steel rolling-mill in Argentina, and that Argentine technicians are being sent to Pittsburgh for training.

German Scientists for Australia

According to information released in New York by Australian officials, three German scientists and engineers in the chemical industry are going to Australia to do research work in micro-analysis of elements and the gasification of brown coal. The scientists involved are Dr. Frederick Danulat, inventor of a process for the extraction of tar and gas from brown coal; Dr. Erich Bruggerman, chemical engineer and designer of the extraction plant and Dr. Carl Tettweiler, a chemical engineer who has been engaged in outstanding scientific teaching and research work in Germany. Dr. Tettweiler will be lent to the University of Melbourne, where he will be engaged in research work and also give lectures on the automatic micro-analysis of elements, a work new to Australia. Drs. Danulat and Bruggerman will be employed by the Victorian Government for further work on the gasification of brown coal.

Coal Consumers' Councils

The Ministry of Fuel announced this week the appointment of Dame Vera Laughton Mathews, D.B.E., as chairman of the Domestic Coal Consumers' Council, and Sir Ernest W. Smith, the fuel technologist and former president of the Institute of Fuel, as chairman of the Industrial Coal Consumers' Council. Both organisations are set up on the authority of the Coal Industry Nationalisation Act. Dame Laughton Mathews is the former Chief Superintendent of the W.R.N.S. Among the 20 members of the industrial users' organisation are representatives of chemical, glass and metal industries, the railways, gas, electricity and municipal undertakings and the T.G.W. union

Home News Items

Scottish Perfumes for Export.—Perfumes which the manufacturer, Mr. Robert J. Cowie, claims can be brought to maturity in 20 minutes by a process developed after 10 years' work, will be on show at the forthcoming Enterprise Scotland 1947 exhibition.

Soap Works Visit.—About 100 representatives of industrial firms from South Lancashire, Cheshire, and North Wales visited Port Sunlight on July 15, to attend a meeting of the Merseyside Area Industrial Group of the Royal Society for the Prevention of Accidents, and to visit the soap works of Messrs. Lever Brothers. They were entertained to tea at the Hulme Hall.

Iron and Steel Output.—Iron and steel output in May was reduced by the limitation of fuel supplies. The average weekly output of steel ingots and castings during the month was 244,000 tons, representing an annual rate of 12,684,000 tons (equivalent figures in 1946 were 262,000 and 13,619,000 tons). Pig iron production was at the weekly rate of 142,000 tons, against 151,000 tons a week in 1946.

Atomic Energy Prospects.—The most difficult problem in making industrial use of nuclear energy was the use of radio-active products, said Prof. J. D. Cockcroft, director of the Harwell, Berks., atomic research station, delivering the James Clayton lecture at the centenary celebrations in London of the Institution of Mechanical Engineers. The vast protective shields required forbade at present the economic use of such power for vehicles or aircraft.

Liverpool Mayor at Dunlops.—The first belt to go through the great new belting presses installed at the Dunlop factory at Speke was watched, on July 7, by the Lord Mayor of Liverpool (Ald. W. G. Gregson), who visited the factory with the Lady Mayoress. The presses will provide conveyor belting needed for the mechanisation of coal mines. Over 5000 people are employed at the factory and it is expected that 6000 will be employed by the end of the year.

Inquest on Chemical Worker.—A verdict that death had been caused by "aplastic anæmia" and that there was not sufficient evidence to show how it was caused, was returned by the coroner at a Wrexham inquest on Thomas R. Charles, 62, who was formerly employed in the technical laboratory of the Monsanto Chemical Works, Ltd., Ruabon. He was stated to have helped in a chemical process involving the use of benzol. A superintendent of the company said another man had worked 16 years in the laboratory without suffering any ill effect.

Magnesium for Aircraft.—Magnesium metal is being increasingly used in aircraft production—notably the Essex Aero Company's new "Sprite," of all-magnesium construction—and even wider use is predicted for aero structural work in the future on account of the strength and lightness of the metal.

Rayon Production Up.—Total output of rayon, nylon and similar artificial silk yarns showed a marked rise in May. Output of continuous filament yarn and staple fibre was approximately 16.6 million lb., 9 per cent more than in April and 11 per cent above the average in 1946. The peak figure was reached in January when 17.6 million lb. were produced.

Rail Wages up £22.5 Million.—Railway operating costs will be increased by about £22.5 millions as a result of last week's decision by the court of inquiry appointed by the Minister of Transport that railway workers' wages should be raised 7s. 6d. a week. It was stated for the companies that each increase of £7 million in wages necessitated an addition of 3 per cent in railway charges. The working week was reduced from 48 to 44 hours weekly.

Damages for Chemical Worker.—Damages of £1546 and costs were awarded in an action at Manchester to Henry Cocker, 49, millwright, of Castleton Avenue, Stretford, near Manchester, against the Geigy Co., Ltd., Trafford Park, Manchester, for injuries he received when he was poisoned by dimethyl sulphate in December, 1945. As a result he suffered from bronchitis and skin and eye trouble. The plaintiff claimed that he was advised by Dr. William Osborne, a chemist formerly employed at the works, that it was safe to do the work without wearing a gas-mask or rubber gloves.

Pitchblende in Wales?—The neglected Paris mines at Amlwch, once the most important source of copper in Europe, might yield pitchblende, it was suggested at a recent meeting of the North Wales Development Council at Colwyn Bay. Mr. R. D. Briercliffe said that pitchblende had been found in a copper mine in Europe. He was supporting a request by Amlwch Council that active steps should be taken to bring about the reopening of the Paris mines, which have not been worked for many years. The Council decided to act on the suggestion of Mr. Hugh Jones, clerk to Flintshire County Council, that an approach for information should be made to the Rio Tinto Mining Company, whose engineers examined the mines in the 1930s.

PARLIAMENTARY TOPICS

Dead Sea Millions.—The estimated amount of magnesium chloride available in the Dead Sea, according to estimates made in 1923, was 22,000 million metric tons. If this could all have been marketed at the United Kingdom price prevailing in 1923, the value would have been £143,000 million, but this was, of course, highly fanciful assumption.—Mr. A. Creech Jones.

Linseed Oil Controller.—Sir J. Mellor asked the President of the Board of Trade what persons he proposes to authorise to act on behalf of the board with power to issue or revoke licences under the Control of Paint (Amendment) Order, 1947 (S.R. & O., 1947, No. 1292).—Sir S. Cripps: Dr. G. F. New has been authorised under the Control of Paint (Amendment) Order, 1947, to act on behalf of and under the supervision of the Board of Trade in the issue of licences to paint manufacturers for the acquisition of linseed oil under the Control of Paint, etc. (No. 3) Order, 1942. It is not proposed to extend his authority to any other form of licensing procedure under the order.

Tung Oil Experiment.—Captain W. J. Field asked the Secretary of State for the Colonies what progress has been made in the working of the Tung Oil Scheme in Nyasaland.—Mr. Creech Jones: The scheme is an experimental one to determine whether large-scale development is practicable. It has only been in operation for a year and, considering the remoteness of the area, progress has been satisfactory. Work is in hand on some 500 acres, of which 25 acres have been planted with tung and a further 250 acres have been cleared for planting.

Deficient Coal Rations.—Attention was called by Mr. G. M. Sharp to the fact that not all firms are receiving their industrial fuel allocation and were being compelled to use up stocks they had been ordered to build up for winter. A spokesman for the Ministry of Fuel admitted that the amount provided for in the programme had not been received "by every firm in every area." He gave an assurance that when receipts of a particular firm were below average, action would be taken to increase supplies. He invited particulars of specific cases.

Effect of Strikes.—The total number of man shifts lost through disputes in the coal-mining industry in the 26 weeks ended June 28, 1947, was 311,300. Information is not available which would enable me to distinguish between unofficial and official strikes.—Mr. G. Isaacs (Minister of Labour).

U.S. IRON DEVELOPMENTS

Two methods of increasing iron and steel production—one using high-pressure blowing in blast furnaces, the other oxygen in the refining of steel—were recently described at the annual meeting of the American Iron and Steel Institute. The new pressure-blowing method was developed by Arthur D. Little, Inc., research chemists, who claim that it will increase the iron output of a blast furnace by 20 per cent and reduce its coke consumption by 12 per cent. According to an official of the well-known Republic Steel Corporation, by the blowing of a blast furnace at a rate of 110,000 cu. ft. a minute over a period of six months, output has been increased by 11 to 20 per cent. Further gains are expected after the installation of 125,000 cu. ft. per minute blowers. The changes required in fitting the pressure equipment cost from $70,000 to $150,000, representing about 1 per cent of the total amount invested in a furnace.

It is claimed that the use of oxygen in open-hearth steel refining speeds up the process by 25 per cent. The oxygen, supplied through a 1-in. pipe, is introduced at a rate of 27 to 62 lb. per minute. The installation is said to have cost $500,000.

The delegates generally agreed that they expected the demand for U.S. steel to continue at high levels, with a production rate of over 90 per cent of capacity. Any decline in demand from the building trades would be absorbed by the railway companies and by overseas markets.

Next Week's Events

TUESDAY, JULY 29—THURSDAY 31

Society of Chemical Industry. Annual General Meeting. Tuesday 29—London Section. Royal Institution, Albemarle Street, W.1, 6 p.m. Francis J. Curtis: "Values" (Jubilee Memorial lecture). Wednesday 30—Food Group. The Connaught Rooms, Great Queen Street, Kingsway, W.C., 10 a.m. Dr. D. W. Kent-Jones: "Some present trends and future developments in Baking," Dr. J. G. Davis: "Cheese—What should our policy be?" Dr. J. A. Lovern: "Some present trends and future developments in the Fish Industry," and Dr. D. H. F. Clayson: "Some present trends in the evaluation of Hygienic quality of Ice Cream." Road and Building Materials Group. A. V. Hussey: "Synthetic Bauxite." Plastics Group. 2.30 p.m. Foster Sproxton: "Preparing for Change." Agricultural Group. Dr. M. A. H. Tincker: "Chemical Regulators of Plant Growth." Thursday 31—Chemical Engineering Group. 10 a.m. W. A. Damon: "Experiences of an Alkali Inspector." The Royal Institution, Albemarle Street, W.1, 2.30 p.m. Dr. A. Fleck: "Castner and his Work."

Overseas News Items

U.S. Magnesium Oxide.—With the recent completion of the Pittsfield (Mass.) magnesium oxide plant of the General Electric Company of America, that concern has now doubled its capacity.

U.S. Chemical Output.—According to the June report of the U.S. Department of Commerce, chemical output is insufficient to meet demand, caustic soda, soda ash and several other important products being in particularly short supply.

Swiss Capital for Hungarian Chemical Plant.—Negotiations are reported to be taking place in Switzerland for the erection in Hungary of a large-scale chemical plant with Swiss capital. Eastern European markets would be supplied by the new project.

To Restrict Rubber Output?—An appeal for co-operation with a view to reducing output of natural rubber in Malaya if the U.S. continues to decline to reduce its production of synthetic rubber has been made by the chairman of the Malayan Rubber Estate Owners' Association.

Russian Iron-ore Prospecting.—U.S.S.R. iron-ore prospecting activities this year will be chiefly concentrated in the Karelo-Finnish Republic, in the Ukraine near Kremenchug, in the Urals, and in the Yenissei Mountains of Siberia, where extensive deposits of high-grade ores were found last year. It is reported that these deposits may be of greater importance than the well-known deposits of Krivoi Rog.

France Self-sufficient in Penicillin.—By the end of the current year, according to a statement by the chairman of the Rhone-Poulenc group, one of France's leading chemical and pharmaceutical manufacturers, penicillin production will be sufficiently high to dispense with imports. The company proposes to bring a second plant into operation at an early date, and envisages a production of some 50,000 mega units a month by October.

Montecatini Ousting Farben.—The great Italian chemical combine, the Montecatini works, with headquarters in Milan, hopes to be able to take the place in foreign markets of Germany's onetime great chemical industry. The statement to this effect was recently made by the director-general of this well-known firm, and increased activity of Montecatini in the chemical markets is soon to be expected, especially in the Near East and South America. The German Dye Trust (I. G. Farben) is reported to have held 40 per cent of the shares in the Italian ACNA combine, one of the strongest units in the Montecatini combine.

U.S. ends Export Control on Certain Waxes.—U.S. export controls on unrefined and semi-refined paraffin waxes, slop waxes, and mineral waxes, except ceresins, have been discontinued.

Franco-Belgian Trade.—A trade agreement between France and the Belgium-Luxembourg Customs Union provides, *inter alia,* for the exchange of phosphates from France against iron and steel goods and non-ferrous metals.

U.S. Chemical Production.—According to the president of the Manufacturing Chemists' Association of America, U.S. chemical production is now above the war-time record. Output is reported to be 429 per cent above the average for the years 1935-39, compared with 412 per cent for 1940-45.

Chrome Deposits Discovered in Rumania.—Chrome deposits are reported to have been discovered near Turnu-Severin, the Rumanian river port on the Danube. The ore is said to have a metal content of about 50 per cent, and there may be a total yield of some two million tons of chrome.

Czecho-Russian Chemical Links.—According to recent reports from Prague, the Czechoslovak nationalised chemical industry has sent representatives to Moscow for the purpose of obtaining supplies of raw materials. Concurrent negotiations took place between a delegation from the Czechoslovak salt monopoly company and their opposite numbers in the U.S.S.R.

Egypt's Fertiliser Production Plans.—The Abu Zaabal and Kafr El Zayat Fertiliser and Chemical Company, a company recently formed in Cairo under Royal Decree with an initial capital of £E 325,000, plans to produce about 30,000 tons of superphosphate per annum. Rock phosphates from Upper Egypt will be used as raw material, and employees will number about 100 persons. A sulphuric acid plant with a capacity of 400 tons weekly is also to be established.

Caustic Soda Shortage in Egypt.—Representatives of soap and textile manufacturers, together with spokesmen of other interested industries, have approached the Egyptian Government with a view to increasing imports of caustic soda, at present in short supply. Home production is estimated at 7000 tons per year, whereas 10,000 tons is regarded as the present minimum annual consumption. A new artificial silk mill which is due to commence production soon, and which will require 800 tons of caustic soda this year, will considerably aggravate the shortage unless positive steps are taken immediately.

Franco-Swedish Trade.—Under a provisional agreement covering the four months to the end of October, France is to export bauxite, gypsum, cast-iron products, lead, sodium sulphate, soda ash, potash, etc., to Sweden. In return, Sweden will send machinery, steel, and other traditional products to France.

Synthetic v. Natural Rubber.—A movement to limit the production of synthetic rubber in the interests of natural rubber producers, hit by falling prices, failed after eight days' discussion in Paris by the International Rubber Study Organisation. The U.S.A. representatives are stated to have strenuously resisted the suggested restriction of synthetic production.

Monsanto's Atom Laboratory. — The atomic energy research centre, part of which is underground, which the Monsanto Chemical Co. will operate at Miamisburg, Ohio, U.S.A., is now being constructed. Part of the laboratory is underground in order to obtain special conditions required for certain chemical processes. Complete silence is being preserved as to the design, construction and operation of the plant.

Holland-Bulgaria Trade Agreement.—A treaty has been concluded with the Netherlands and Bulgaria for the regulation of commercial relations and transactions between the two countries. Holland is to supply chemicals, pharmaceutical and rubber products, radio components and seeds, while Bulgaria will send pyrites, timber, opium, tobacco and fruit pulp. Payment will be made in guilders, and the agreement is valid for one year.

Persian Oil Line.—Co-operation of the Anglo-Iranian Oil Company with the Standard Oil Company of New Jersey and the Socony Vacuum Oil Company in laying a 30 in. diameter pipeline from the head of the Persian Gulf to the Mediterranean was referred to by the chairman of Anglo-Iranian (Sir William Fraser) in a statement to stockholders. When completed it will cut by some 3000 miles the distance by which oil has to be carried by sea from the Eastern Mediterranean.

U.S. Steel Production.—The American Iron and Steel Institute reports production of over 72,000,000 metric tons of steel in the past 12 months—over 13,000,000 tons higher than the previous best peace-time year. For the current calendar year the industry anticipates a total of about 76,000,000 tons, *i.e.*, nearly 30 per cent more steel than the U.S. has been able to use in any one year. The last five months have shown an operating rate of more than 95 per cent of ingot capacity, which was equalled only once before in peace-time—in 1929.

Canadian Chemical Exports Up.—Canadian external trade returns show that exports of chemicals and allied products in May, 1947, were worth $7,915,000, an increase of more than $2,000,000 over the exports for May, 1946, which totalled $5,826,000. Exports for the first five months of 1947 totalled $33,530,000 as against $27,855,000 in the same period last year.

Rumanian Oilfields "Purge."—Staffs of British and American oil interests in Rumania, Rumanian nationals, are reported to have been victimised by the present political régime in that country. Many of the key personnel in the oilfields are stated to have been removed, charged in general terms with sabotage and "anti-democratic" behaviour. The present fall in oil output is likely to be greatly accelerated as a result.

Poland Buying Pharmaceuticals. — Polish pharmaceutical chemists are being sent shortly on a mission to the U.K. and Sweden to purchase in Britain £1 million worth of medicines and in Sweden 4 million crown's worth. As a result of an agreement concluded by the Polish Ministry of Health, the Swiss chemical firm of C.I.B.A. will supply chemical products and medicines to the value of 4 million Swiss francs.

West African Groundnuts.—Encouraging telegrams are reaching the Colonial Office from the mission of experts examining the possibility of developing a large groundnuts scheme in West Africa, in Gambia which already has estates, and in Nigeria, the Gold Coast and Sierra Leone. If surveys confirm estimates, the West African scheme might, in full production, supply about one-third of the major plan. Unilevers are associated with the project.

Syria To Buy Laboratory Equipment and Chemicals.—According to information received in the United States recently from the American Legation in Damascus, the Syrian Government is to place a $10,000 order for laboratory equipment and chemicals. Price lists should be sent to Dr. Youssef Khoury, Director of Technical Bureau, Office of Concessionary Companies and Mines, Ministry of Public Works, Damascus, Syria.

Menthol Slump in Brazil.—Because of a severe reduction in U.S. orders, Brazil is finding it difficult to dispose of its large stocks of menthol. During the war, production was greatly encouraged and it is reported that whole communities, in areas served by the Sorocabana and North-Eastern Railways, have become almost entirely dependent on menthol for their livelihood. The price per kilogramme is now back to the pre-war level of 50 cruzeiros, although Japan, an important pre-war producer, has not yet returned to the market.

Personal

Dr. D. H. Peacock has been appointed lecturer in chemistry at Sheffield University.

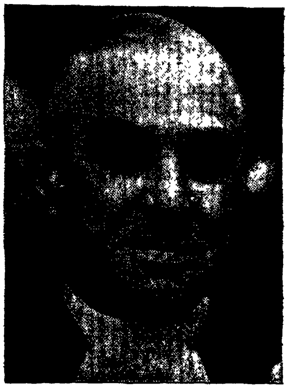
Mr. C. Cookson and Col. A. J. Foster have resigned from the board of Goodlass Wall & Lead Industries.

Mr. T. C. Betteridge has been appointed a director of Cooper McDougal & Robertson, Ltd., insecticide manufacturers.

Sir Edward Appleton, Sir Alexander Fleming, and Sir Arthur McNalty have been elected honorary fellows of the Royal Society of Edinburgh.

The Council of the British Institute of Management has appointed to be the director of the Institute Mr. Leo Russell, who is relinquishing a Board of Trade appointment to take up the work this autumn.

Sir Frederick Wells, for 20 years managing director of Sanitas, Ltd., manufacturers of disinfectants and other coal-tar products, may become London's next Lord Mayor. He is now senior among the aldermen who have not sat in the civic chair. He is 63 years of age, and has attained seniority owing to the recent resignation of Sir Charles McRae and Mr. Septimus Marshall.



Sir Frederick Wells

Prof. J. G. Smith, vice-principal to Birmingham University, has retired after having been in the service of the University for 28 years. His successor as vice-principal is Sir Norman Haworth, professor of chemistry at the same university.

Mr. Leslie Gamage, joint managing director of the General Electric Co., Ltd., has been re-elected chairman of the British Export Trade Research Organisation, for the ensuing year. Sir Percy Lister, of R. A. Lister & Co., Ltd., is succeeded as deputy chairman by Mr. John Ryan, M.C., of Metal Box Co., Ltd.

Prof. C. N. Hinshelwood (president of the Chemical Society), Dr. Lee's professor of chemistry in the University of Oxford, has had an honorary degree conferred upon him by the University of London. The same university has also conferred honorary degrees on the following: Prof. J. N. Brønsted, professor of chemistry in the University of Copenhagen; Prof. P. Karrer, professor of chemistry in the University of Zurich; and Prof. L. C. Pauling, professor of chemistry in the California Institute of Technology.

The annual distribution of long-service awards to employees of the Gaskell Marsh group of the I.C.I. was renewed on July 15 at Widnes, when recipients—constituting the first party out of 437 members—assembled at the I.C.I. Recreation Club. Certificates were given to 39 old-age pensioners, and 86 others still working with over 40 years' service who were to receive chiming clocks. Those entitled to gold watches for over 30 years' service number 21. The oldest employees were William Dodd with 53 years, and J. Hewitt with 51 years. Mr. W. H. Palmer, manager, presided. Mr. V. St. J. Killery, chairman of the General Chemical Division of the I.C.I., said he was much impressed by what Widnes had done during the war.

Workers on I.C.I. Board

Unique Proposal Rejected

The July number of *The I.C.I. Magazine* records that at the 23rd ordinary meeting of the Central Council of I.C.I. held in Blackpool recently, Mr. Lyons (Billingham) proposed the election of an employees' representative to the board of directors.

Replying for the board, the chairman (Lord McGowan) said: "There is no such thing as a representative of any body of any kind on the board of I.C.I. to-day. The board of I.C.I. are there for a particular function; they have been selected to perform that function; that is, for direction. They cannot be the delegates nor the representatives of any body; they are not. In my view, industry is one great army and it marches as one army, under its competent leaders. If they are not competent, then there are means of getting rid of them, but there is only one standard and only one test for those who shall direct and lead, and that is their competency to lead. I regard myself as a representative of the workers as much as anybody in this room. I have been a worker; I have been a day man and I have been a shift man; but I would be a very bad and incompetent deputy chairman of I.C.I. if I said: 'I am going to represent a certain class or a certain section of those who are part of what I regard as the finest industrial instrument in this country.'"

The resoution was not carried.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfaction

BAIRD & TATLOCK (LONDON) LTD., chemists. (M.S. 26/7/46.) Satisfaction June 14, of debentures registered May 24, 1932, to the extent of £1000.

Increases of Capital

The nominal capital of **Shell Chemical Manufacturing Company, Ltd.,** St. Helens Court, London, E.C., has been increased beyond the registered capital of £100,000, by £2,900,000, in £1 ordinary shares.

The nominal capital of **Metallurgical Chemists, Ltd.,** 12 Henrietta Street, London, W.C.2, has been increased beyond the registered capital of £500, by £6500, in £1 shares.

Company News

International Bitumen Emulsions has declared a dividend of 15 per cent. The year's profits amount to £28,762 compared with £16,232 for the previous year.

The name of **Rubber Industries and Shermans Chemicals, Ltd.,** 19 Eastcheap, London, E.C.3., has been changed to Rubber Industries and Sherman Chemicals, Ltd., as from May 6, 1947.

Genatosan Trust, a subsidiary of **Fisons,** has increased its capital to £1,297,150 by the creation of 594,300 10s. ordinary shares, in order to acquire the share capital of **Whiffen and Sons,** the Fulham manufacturing chemists.

The nominal capital of **Genatosan Trust, Ltd.,** Investment Trust, Harvest House, Ipswich, has been increased beyond the registered capital of £1,000,000, by £297,150, in 594,300 ordinary shares of 10s. This increase is for the purpose of acquiring the share capital of Whiffen and Sons, Ltd.

The nominal capital of **Monsanto Chemicals, Ltd.,** Victoria Station House, London, S.W.1., has been increased beyond the registered capital of £800,000, by £2,200,000 in 2,200,000 ordinary shares of 10s. and 1,100,000 3¾ per cent redeemable cumulative preference shares of £1.

At the recent extraordinary general meeting of **Ciba,** Basle, the leading Swiss chemical and pharmaceutical manufacturers, it was unanimously decided to increase the share capital from 40 to 60 million Swiss francs by increasing the nominal value of each share from 1,000 to 1,500 francs. General reserve was brought up to one-fifth of the share capital, *i.e.*, to 12 million francs. Furthermore, 40,000 shares at 1,500 francs each will be divided into 120,000 shares at 500 francs each. It was also agreed to convert the present bearer shares into name shares. The group's articles of association will be amended in accordance with these decisions.

New Companies Registered

Beverley Manufacturing Company, Ltd. (438,168). — Private company. Capital £3,000 in 3,000 ordinary shares of £1 each. Manufacturers of cellulose and its constituents, sprayers, paints, etc. Directors: L. Tann; U. Bernard; P. Forse and J. J. Vallins. Registered office: 117 Newgate Street, London, E.C.1.

Hartford Products, Ltd. (435,926).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, drugs, disinfectants, fertilisers, plasters, oils, colours, polishes, photographic and toilet requisites, etc. Directors: W. Creasey, and F. C. S. Major. Registered office: 61-3, Cobden Street, Luton.

Watts & Sons (Banbury), Ltd. (438,090). —Private company. Capital £50,000 in £1 shares. Dealers in and agents for grain, seeds, hay, straw, oils, fodder, manure and fertilisers, cattle food and feeding and fattening preparations, patent and other medicines and drugs, etc. Directors: A. P. Watts and R. E. Watts. Solicitors: F. W. Blincowe, Banbury. Registered office: 6/7 Bridge Street, Banbury.

J. and P. Supplies, Ltd. (438,581).—Private company. Capital £1,000 in £1 shares. To carry on the business of manufacturers and importers of and dealers in fertilisers, manures and animal and poultry feeding stuff; manufacturing chemists, manufacturers of and dealers in engineers' requisites and machinery, etc. Directors: H. S. Johnson and Fdk. T. Perrins. Registered office: New Street Chambers, New Street, Stourbridge.

Splendor (Ireland), Ltd. (11,923).—Private company. Capital £10,000 in £1 shares. Manufacturers and repairers of and dealers in all kinds of sanitary, surgical, dental, optical, electrical, chemical and scientific instruments, etc. Subscribers: E. J. Crowley and Wm. J. Walsh, both of 3 Lower O'Connell Street, Dublin.

Chemical and Allied Stocks and Shares

WITH holiday influences more in evidence and international uncertainties also tending to check buying interest, values in stock markets were again inclined to lose ground. A renewed decline in British Funds at the beginning of the week domi-

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nated sentiment, but generally movements in industrial shares were moderate, and good features were not entirely lacking.

In accordance with the general tendency, small irregular movements characterised chemical and kindred shares, Imperial Chemical easing to 51s. 7½d., while Monsanto Chemicals 5s. ordinary were 61s. 9d., and Greeff-Chemical Holdings 5s. ordinary transferred around 17s. 3d. B. Laporte have changed hands up to 101s. 3d, and W. J. Bush marked 91s. 3d. Lever & Unilever were active and at one time touched 57s. on rumours that the dividend equalisation agreement with Lever N.V. the Dutch company, might be modified; but later the price eased, this rumour lacking confirmation. United Molasses came back to 55s. 9d. British Plaster Board was steady at 31s., and elsewhere, the units of the Distillers Co. remained active up to 153s. awaiting the final dividend announcement due next month.

Pinchin Johnson at 68s. were good among paint shares, while in other directions, Turner & Newall were firm at 89s. at the beginning of the week. Hardman & Holden 5s. shares were 32s. 9d. Dunlop Rubber were 77s., and Associated Cement improved to 78s. A feature was a better tendency in iron and steel shares on wider recognition that in many cases prices appear to have been unduly depressed by nationalisation uncertainties and that a fair compensation basis in the event of nationalisation would probably be well above current levels. Dorman Long strengthened to 27s. 3d., W. Beardmore to 47s. 3d., Thomas & Baldwins were 13s. 4½d., and United Steel 26s. 3d. Stewarts & Lloyds, however, eased to 54s. 3d., although elsewhere, Babcock & Wilcox have been firm at 77s. Amalgamated Metal remained at 19s. 6d., and in other directions Birmid Industries rallied to 82s. 6d. Borax Consolidated were slightly lower at 59s. 9d., British Aluminium 50s. 4½d., British Match 46s. 3d., British Oxygen 105s. 7½d., and Wall Paper Manufacturers deferred 56s.

Courtaulds eased to 51s. 4½d., and British Celanese were 30s. 4½d., but Bradford Dyers at 22s. 7½d. showed steadiness, Calico Printers were 22s. 1½d., and Bleachers 12s. 3d. Fisons have changed hands around 64s., and British Drug Houses were 63s. Glaxo Laboratories were dealt in actively around £25½. Reflecting the strong position disclosed by the annual report, British Glues 4s. ordinary have strengthened to 20s. 9d.

Boots Drug were 66s. 3d., Griffiths Hughes 56s. 6d., and Beechams deferred 27s. General Refractories eased to 24s. 10½d., and in other directions, Sangers have been steady at 37s. 6d. Low Temperature Carbonisation 2s shares have been active around 5s. 1½d., and among shares of companies with interests in plastics, De La Rue were 60s. xd. There has been considerable activity in Steel Company of Wales 3 per cent debentures, a large part of which was left with the underwriters. Yield considerations are attracting more attention to this stock, which is now £25 paid, and after opening at only 23¾ last week has since improved to 24¾.

Oil shares remained prominent under the lead of Anglo-Iranian, which on further consideration of the annual report advanced to £11 9/16, before profit-taking caused a moderate reaction to £11⅜. Shell and other leading oil shares also failed to keep best levels, and Burmah were affected by the latest Burmese news, but on the other hand, Attock Oil moved higher and Trinidad Leaseholds were inclined to attract attention.

British Chemical Prices

Market Reports

CONDITIONS on the industrial chemicals market continue more or less as reported last week, there being little change in the overall supply position. The home industrial demand is able to absorb any offers that come on the market and export inquiry remains on a considerable scale There has been a reduction of £2 per ton in the quotation for copper sulphate, but the price position generally is unaltered and firm. The coal-tar products market is steady and demand, with a few exceptions, is ahead of current production.

MANCHESTER.—In spite of holiday influences which are now approaching their height, steady trading conditions have been reported on the Manchester chemical market during the past week. Most of the bread-and-butter lines are being called off steadily by the cotton and woollen textile and other leading industrial consumers, and there are still some complaints, but deliveries tend to fall below day-to-day requirements. Export bookings are also coming forward steadily, with shippers pressing for an acceleration of deliveries against orders placed some time ago. Quiet conditions still rule in respect of the fertiliser trade. In tar products, the leading light and heavy products continue to meet with a good demand.

GLASGOW.—During the past week in the Scottish chemical market there has been the usual stocking up prior to trade holidays. The soda ash position which was already very difficult has been further worsened by shortage of fuel resulting in the necessary reduction of supplies to all regular consumers. In the export market, a number of orders have again been booked and shipping position eased. Inquiries continue but on a reduced scale.

The Chemical Age

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The Case for the Combine

THE international aspect of chemistry was very much to the fore in London last month, underlined by two international congresses. There is equally an international flavour about the firm of Castner Kellner, now part of Imperial Chemical Industries, Ltd., and lately celebrating its Jubilee.

The Leblanc process for the manufacture of ammonia-soda led also to the manufacture of caustic soda. But between the years 1886 and 1892 there was developed a rival process through the work of Hamilton Y. Castner. Castner, born in America in 1859, came to London in 1886 to work upon a cheap process for making sodium and potassium, the sodium being used for the preparation of metallic aluminium. In 1891 Castner developed a new process for making sodium by the electrolysis of brine. It happened that Kellner, an Austrian, was working in Vienna on the same problem and very wisely the two investigators decided to join forces, forming the Castner-Kellner Company in 1895. In the recent jubilee celebration optimism was the keynote, and it was felt that what had been accomplished over the last 50 years would be surpassed in the next half-century.

That is the optimism with which all great businesses must be run and it has realistic foundations. Lord McGowan, chairman of I.C.I., has reviewed some of the conditions of modern industry and has given reasons for the optimism which leaders of the chemical industry feel. It has been held against I.C.I. that as a business organisation it was too vast; it could not be adequately governed and organised; with its international ramifications, which sometimes lead it into trouble of an international character, the management, it was thought, must be over-weighted by their responsibility.

This is, of course, a question of organisation. Any very large concern must be organised with something of the inflexibility of the Civil Service. Decisions must be taken by certain people and not by others. The inherent difficulty in an organisation of this character is to provide a system which will be sufficiently rigidly geared to operate soundly, and flexible enough to make use of the individual qualities of its employees and staff and to permit the making of rapid decisions so necessary for the efficient conduct of business.

Nationalisation is regarded by some as a step in this direction. The success of nationalised industries, like the success of these combines, must depend upon the skill with which they are organised. Lord McGowan in his speech at the Castner-Kellner anniversary dinner disagreed with that conception of nationalisation. We assume that his disagreement was not with the conception of a unified industry under one board of management so much as with the public ownership of industry.

We have our own doubts about the wisdom of nationalisation. Like Lord McGowan, however, we hold where nationalisation has been decided upon by popular vote it is necessary to do all in our power to make it work. Whether it will work or not depends on the skill with which those in control weld their organisation into a team and set up machinery of management which will enable decisions on small matters as well as great to be

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taken quickly by those who are best able to make them.

Lord McGowan asserted that so far from "big units" being unfruitful, the Castner-Kellner works could never have been as successful had they continued to stand alone instead of becoming a part of the larger I.C.I. In many directions there is a great deal to be said for the small firm. We have visited small factories employing less than 500 hands in which all worked as a happy family. These factories, however, were frequently successful because they were in small industries, the total demand being capable of supply by a very limited number of small firms. In large fields in which considerable production is required it very often happens that the most successful business organisation is one in which firms making similar goods operate as a unit and ultimately combine either horizontally with allied industries or vertically with the suppliers of raw material and the purchasers of finished products. There is a strength about organisations of that character which enables them to meet periods of bad trade more successfully than the small individual firm, while their bargaining power in international trade is immensely increased.

In research the big concern has a special advantage. In his centenary address to the Chemical Society Prof. C. N. Hinshelwood touched upon the difficulty of combining organised research with the individualistic research which has produced such excellent results in the past, and he concluded that there must be a reasonable blend of the two methods. If the individual research worker uncovers some brilliant discovery which can be turned to good purposes, it is the large organisation that can best set aside resources and staff to translate the concept of pure science into manufacturing processes.

Not infrequently in the small organisation the limited number of employees must spend their whole time on designing, erecting or operating plant which is producing immediate revenue. On the other hand, as Lord McGowan pointed out, "the big unit known as I.C.I., has been able to improve the efficiency of its component parts by a vast expenditure on research, but this research has led to the development of entirely new products. These are vital to make good the loss of export revenue which inevitably follows when other countries begin to make established lines which they previously bought from us."

In that sentence we have in a nutshell the need for research on a great scale and an important justification of large units. Markets will inevitably be lost as other countries become industrialised and the replacement by new products of products for which export markets have been lost must be continuous. That can be done only by research and development work. In this we do not refer only to chemical research, but to every kind of investigational thought which results in the production of something new which is needed by others who cannot manufacture it for themselves.

NOTES AND COMMENTS

Our Atomic Plants

SIR WALLACE AKERS, well known for his work in connection with the preliminary organisation of the atomic bomb project, did the British chemical industry and British science in general a good service when he drew attention, at this week's luncheon of the London section of the Society of Chemical Industry, to the essential ground-work of British scientists on which later work on the atomic bomb and atomic energy is founded. He pointed out that work on the structure of the atom and the nucleus was principally carried out in Britain, and most of it at the Cavendish Laboratory. Sir Wallace was optimistic regarding the construction work on atomic energy plants and other plants associated with them. He presumably knows what and how much work is going on, and if he can re-assure us as to the pace of the work, we do not see why the government could not do the same, and perhaps even drop a few factual crumbs of news about it.

Better Working Conditions

THE report of the joint advisory committee which was appointed in 1945 to study means whereby ironfoundries can be made safer and pleasanter places to work in is published this week and unwittingly underlines by some of its own observations and by the context of events how the onus of responsibility on managements has intensified and how little co-operation is still forthcoming from the workers. Publication of the "Report of the Joint Advisory Committee on Conditions in Ironfoundries" (extracts from which appear in the Metallurgical Section of this issue) coincides with somewhat ironical effect with the announcement from South Yorkshire that more than 1000 members of the Iron and Steel Trades Confederation are refusing to honour the agreement entered into between their union and the employers to operate a shift system on the basis of the 48-hour week to enable continuous processes to be maintained in certain departments over the week-end periods. "Blocks, billets and slabs" are evidently not the least tractible material with which the iron and steel industry has to contend and the same reluctance to co-operate represents a continuing problem to those planning to improve amenities. This anomaly is not evaded in the present report, which deplores the absence in some foundries of any canteen or messroom facilities, but admits that: "Even where good facilities are available, some of the older workers have become so accustomed to taking their meals at or near their work-places during the years when they had no alternative that they now seem reluctant to change their habits. These conditions are, in our opinion, obviously undesirable. We consider that provision should be made for all persons who wish to remain on the premises at meal-times to take their meals in clean and comfortable surroundings and that the practice of taking meals in the foundry itself should be prohibited." The fact that prohibitions are required in this and many other directions to oblige work-people to implement the measures designed for their own safety and comfort is a paradox with which the chemical and metal industries are fairly familiar. It should not be allowed, however, to deter the adoption of the enlightened policies which the committee advocates for better working conditions and, indirectly, the efficiency of existing foundries and those yet to be built.

The Congress

HOW does the XIth International Chemical Congress appear in retrospect? Of course, there were a great many people there, but there were also several notable absentees, both personal and in subject matter. It is a great pity that after a tremendous struggle for freedom the scientist should now find himself bound by penal rules not to discuss certain aspects of science. How we should have welcomed the chance of hearing some of the Americans who have been doing such grand pioneering work in the field of atomic engineering. But we did not. And science is the loser. Apart from this, what struck us most was the enthusiasm of those taking part. And not only to hear that particular subject in which they were most interested, but also to get as much information as they could from papers only remotely connected with their branch of chemistry. In many cases the lecture rooms were so full that latecomers had no chance of getting in. That was very encouraging, but it must be admitted that there were some liabilities.

Some Disappointments

THERE was also disappointment among some delegates, as the scientific correspondent of the *Manchester Guardian*, too, points out. It seemed as though much of the clerical work had been left too late, and then there was no time to clear off arrears. Delegates did not receive all the papers they should have done before leaving for the Congress. Many found their papers waiting for them on the day of the opening itself. A large proportion of those who applied to visit certain laboratories either did not get tickets at all, or got tickets to places they had no desire to see. Other complaints were that the abstracts of papers were hardly abstracts at all—they appeared to be just an amplified title. One delegate after reading his paper and handing in his manuscript was unable even to get an abstract of it—apparently an insufficient number had been printed. We are not carping when we instance these disharmonious happenings. We put them on record so that the organisers of the next conference will try to avoid them; that is if there is another conference on such a large scale and covering such a wide field. The *Manchester Guardian's* suggestion that these conferences are too unwieldy may contain the answer. In our own experience the St. Andrews Symposium held recently on one particular aspect of chemistry went off very well indeed. It was small enough to handle well, and there were not so many people that it was impossible to meet them all.

Bulk Buying Attacked

BRITAIN'S bulk buying commissions are not the friendless institutions which a study of public opinion in this country would represent them to be. Throughout the countries supplying Britain's essential industrial requirements of raw materials or semi-manufactures in short supply the ministerial buyers are held in the highest regard, not for their services in facilitating trade and fostering wider exchanges, but because of the liberality with which they approve contracts at prices some hundreds per cent higher than ordinary commercial buyers ever contemplated. Selling agencies "see them coming a mile off"—with all that that connotes colloquially. In other words, Britain and every British industry which depends entirely upon supplies from a Ministry are paying through the nose and in the process they are helping to force world prices to higher levels than even the insistent world demand and limited supply can justify. These are some of the charges on which was based the recent expert and concerted attack in the House of Commons upon the operaions of the hydra-headed Ministry of Supply, especially in relation to its operations as monopolistic supplier of non-ferrous metals, including, it was said, some 1000 tons a day of electrolytic copper (at £182 per ton and recently £137 as against about £62 at the end of the war) and of wholly inadequate quantities of tin and lead. The Minister (Mr. J. Wilmot), in accordance with recent Government practice, did not trouble himself to reply specifically to most of the charges raised by the former Controller of Non-Ferrous Metals (Mr. Oliver Lyttelton) and Mr. Brendan Bracken, being content to dismiss the price squeeze as an inevitable result of world shortages unforeseen at the end of the war. Despite this apparent indifference to a situation which is putting British manufacturers in a score of industries in a weak position in increasingly competitive markets, the exposition on the wider platform of the alarming situation which has developed during the continued suppression of the London Metal Exchange may yet have good results, in addition to putting on record the convictions freely expressed in industrial circles (THE CHEMICAL AGE, June 14). It provides, in particular, powerful support for the representations which it is understood the British Non-Ferrous Metals Federation has lately made to the Government on the same subject.

New Czech Potash Works

A sign of the country's progress in rebuilding those chemical factories which were damaged during the war is the re-construction of the Kolin Potash Works. These chemical factories, situated about 40 miles from Prague, were unique in their manufacture of potassium and soda cyanide from molasses residues, in addition to potassium salts. There are only three works of this kind in the world. The products were mainly exported to countries using them for the extraction of gold. The Kolin factory was one of the most severely bombed during the war.

The company (the shareholding of which was held partly by the German Dagusa) has been nationalised and now forms part of Synthesia (National Corporation), one of the largest chemical undertakings in Czechoslovakia.

Society of Chemical Industry

Reception and Annual Luncheon

AS a prelude to the 1947 annual general meeting, the Society of Chemical Industry held a reception on Monday evening last at the Connaught Rooms, Kingsway, W.C. Guests were received by the president, Dr. Leslie H. Lampitt, and Mrs. Lampitt. Celebrities present included Dr. and Mrs. L. A. Jordan, Dr. Gale, Dr. Frank Curtis and Dr. W. D. Scott (both of Monsanto Chemicals) and Mr. A. L. Bacharach. The occasion, which was an informal one, was conspicuous for its quiet yet friendly atmosphere. There was a pleasing admixture of subdued gaiety and social cordiality to the proceedings.

The dance floor, though at no time overcrowded, always presented an attractive appearance. Indeed the sweltering heat of the earlier part of the day seemed still to persist, so that sustained periods on the floor were the exception rather than the rule.

Buffet arrangements were adequate, cool drinks and ice-cream being in constant demand.

Big Luncheon Assembly

A large gathering of members of the London branch of the Society of Chemical Industry, with friends and guests, attended the annual luncheon of the section at the Connaught Rooms, London, on Tuesday. With the weather on the warm and sticky side the ladies dressed in summery garb, while some of the men, forgetting their traditional conservatism in matters of dress, and led by Mr. Bacharach in a yellow coat, appeared in light-weight or even tropical suits.

The guest of honour, Sir Wallace Akers, was called upon to propose the toast of the London section, and coupled with it the name of Dr. W. H. J. Vernon, the retiring chairman of the London Section. In doing so he referred to the subject—atomic energy—with which his name is usually coupled, and said he would not try to tackle the scientific or technical aspects of this problem. Speaking of the relative positions of this country, the U.S.A. and Canada, Sir Wallace Akers pointed out that the whole of our present information on atomic energy is founded on the knowledge of the structure of the atom and the nucleus, almost the whole of which work had been done in Britain mainly at the Cavendish Laboratory. After the structure of the atom and nucleus had been worked out, the next stage was the discovery of nuclear fission, and most of this work had been done by Frenchmen and Germans. The realisation that it was scientifically possible to produce a military weapon based on nuclear fission first took place in this country. As there was the closest contact between our scientists and those in America, these ideas were almost immediately made known to scientists in the States.

Sir Wallace admitted that the Americans are much more advanced in this field now than we are, but pointed out that our scientists who were helping the Americans are now back in this country. Good progress is going on at Harwell and other plants which are under construction or are being planned in the North of England. "It is my opinion," he said, "that although this work is not going on as fast as we would like, nevertheless, good progress is being made." The Government, he added, realised the importance of this to our country and has allocated to it a fair share of our manpower resources.

"We are behind our American friends" he concluded, "yet I look forward to at least our fair share of novel and important inventions in this field coming from scientists, engineers and our chemists."

Dr. W. H. J. Vernon, the retiring chairman of the London section, spoke with warmth of the representatives of the various sections who had come to attend the functions. They included chemists from Canada, America, Australia and Finland. He said he looked forward to a period of prosperity under Dr. H. Baines (Kodak) the new chairman and Mr. E. L. Streatfield (Filtrators, Ltd.) the new honorary secretary.

ALKALI OUTPUT CUT

No Shut-down

FUEL shortage has forced the Imperial Chemical Industries' alkali division at Northwich, which employs 8000 workers, to reduce output by 30 per cent. There is no immediate danger of a shut down, stated an I.C.I. official, but fuel supplies are on a day to day basis, and if the position worsens it may be found necessary to close down one section of the works. "We want to keep the place going, and have never actually contemplated shutting down," said the official, "but we have had to reduce output, and are working at about 70 per cent of capacity. Some coal is coming through, but the amount we have in hand will not keep us going for more than a few days." He indicated that no substantial increase in production until after August Bank Holiday was likely.

Equivalent cuts are being made in supplies of sodium carbonate to the wool industry and unemployment among workers in the West Riding of Yorkshire may result.

CHEMICAL TRADING IN JUNE

IN addition to the falling off in chemical exports in June, to which attention was drawn in the summary published last week, there have been noteworthy changes in trading in gas and chemical machinery, which seem also to be related to generally reduced productivity in this country. Exports of gas and chemical machinery in June totalled 582,000 tons, as compared with 726,000 tons in the same month a year earlier, and our imports under that heading in the first half of the year showed an exceptional increase from 11,000 tons in 1946 to 323,000 tons. Overseas purchases of machinery for the glass industry also increased by more than 200 per cent—from 66,000 tons to 216,000 tons, in the same period. Some compensation for the increased expenditure of foreign currency in that direction was the increase in our exports of chemical, medical and similar glassware, of which the comparative figures for last June and for June, 1946, were 1,016,000 cwt. (worth £38 million) and 702,000 cwt. (£24 million)

Export and import figures of the principal chemicals and metals in June were :

EXPORTS OF CHEMICALS

	June, 1947	June, 1946
	Tons	Tons
Aluminium oxide	16	519
Sulphate of alumina	2,253	2,673
Sulphate of ammonia	17,108	26,435
Nitrate of ammonia	5,934	5,334
	Cwts.	Cwts.
Chloride of lime	34,312	69,048
Calcium carbide	2,009	3,385
	Gals.	Gals.
Benzol	1,648	32,923
Cresylic acid	188,118	314,408
Tar oil, creosote, anthracene oil, etc.	3,300,276	393,603
	Tons	Tons
Copper sulphate	2,555	7,526
	Cwts.	Cwts.
Disinfectants, insecticides, etc. ...	48,260	42,870
Glycerine	3,362	3,578
Lead acetate, litharge, etc. ...	5,427	5,199
Nickel salts (not sulphate) ...	10,657	2,226
Potassium compounds	6,121	8,776
Sodium carbonate, soda ash, etc.	185,713	264,768
Sodium caustic	99,443	152,778
Sodium chrqmate and bichromate	99	664
Sodium nitrate (synthetic) ...	7,929	4,971
Sodium sulphate	53,519	211,011
	Tons	Tons
Salt	13,186	10,276
Zinc oxide	775	1,823
	£	£
Total value of chemical manufactures	**3,042,548**	**2,899,514**

IMPORTS OF CHEMICALS

	June, 1947	June, 1946
	Cwts.	Cwts.
Acetic acid	4,288	13,002
	Tons	Tons
Ammonium phosphate	55	1,347
Manufactured fertilisers	1,408	12,543
	Cwts.	Cwts.
Potassium chloride	704,159	336,414
Potassium sulphate	16,520	120
Sodium nitrate	60,062	182,234
	£	£
Total value of chemical manufactures	**554,942**	**229,692**

EXPORTS OF METALS

	June, 1947	June, 1946
	Tons	Tons
Iron and steel and manufactures	164,265	194,914
	Cwts.	Cwts.
Aluminium and alloys	65,622	35,298
Brass and copper alloys	79,413	118,283
Nickel	8,978	2,413
	Tons	Tons
Copper	6,099	4,158
Tin	242	3,634
Zinc or spelter	372	531
	£	£
Total value of non-ferrous exports	**3,146,938**	**3,460,077**

IMPORTS OF METALS

	June, 1947	June, 1946
	Cwts.	Cwts.
Aluminium and alloys	244,434	3,295
Brass and copper alloys	936	315
	Tons	Tons
Copper (electrolytic)	25,024	21,587
Copper	16,918	10,212
Lead	15,376	17,719
	Cwts.	Cwts.
Nickel	13,608	1,404
	Tons	Tons
Zinc or spelter	5,787	5,199
	£	£
Total value of non-ferrous imports	**7,733,287**	**3,328,069**

ANOTHER NITRATE DISASTER

A REPETITION, fortunately on a smaller scale, of the disastrous explosion at Texas City in May, following a fire in a ship laden with nitrate of ammonia occurred at Brest on Monday.

The Norwegian vessel *Ocean Liberty,* conveying nitrate of ammonia and fuel oil from New York took fire in Brest harbour and when efforts to master the outbreak in one hold were not successful the ship was towed out of the danger zone.

As this was being done, a violent explosion occurred as the vessel was passing a gasholder, which became involved. The blast severed communications between Brest and Paris and a detailed account of the damage and fatalities was not immediately available.

Many Killed or Injured

First reports stated that some 20 persons, including the Norwegian captain of the *Ocean Liberty,* had been killed and about 500 injured. Destruction in the vicinity of the explosion was very heavy and hundreds of houses throughout Brest were stated to have been damaged more or less severely by a blast which an eye-witness described as "atomic." Reports that the concussion was felt in S.W. England were received next day.

In addition to shattered roofs and broken windows over a wide area, further serious damage resulted from fires which, as at Texas City, broke out in many parts of the town. Petrol tanks and a gasworks were blazing furiously many hours after the explosion and many people evacuated the town, in which the destruction was stated to have been equivalent to a heavy bomber raid.

Anglo-Iranian Distillers Project

Chemicals from Petroleum

SIR William Fraser, chairman of Anglo-Iranian Oil, in which the British Government is the largest shareholder, has negotiated another big deal for his company. With the powerful Distillers group, Anglo-Iranian is forming a new company to manufacture basic industrial chemicals from petroleum. Capital required for this important new venture will be about £5,000,000. It will be provided equally by the two companies from their own resources.

The significance of this new move, insofar as Distillers is concerned, is that it will provide a new source of supply of the chemicals the company requires for the manufacture of industrial alcohol and for the rapidly expanding plastics side of its business.

The new company will also produce detergents. This is a business in which Monsanto and other chemical manufacturers have been active for some time. But demand is greatly in excess of supply, and increased production is urgently needed.

Olympia Exhibition

Among exhibitors at the forthcoming Engineering and Marine Exhibition (August 28 to September 13) at Olympia are:—

Messrs. T. H. and J. Daniels, Ltd. (Stand 10, Row B, ground floor, Grand Hall), who will display plastic moulding presses, including a 50/75-ton model used for moulding Bakelite and Beetle-type plastics.

Wilkinson Rubber Linatex Ltd., Stand F, Section 13, Gallery, Grand Hall, who will be showing the Linatex pump and Linatex ball mill, Flexatex hose, tank, shute and pipe linings and accessories, together with a selection of extrusions in Novatex, a rubber-like oil-resisting material produced in the company's plastics division.

The Lancashire and Corley Steel Manufacturing Co., Ltd. (an associate company of Stewarts and Lloyds) who will exhibit on Stand 4, Row F, ground floor, Grand Hall, a wide range of steel tubes for gas, steam, water, oil, etc., together with a variety of joints and couplings to suit various working conditions; and

The Morgan Crucible Co., Ltd. (Stand 13, Row C, Ground Floor, Grand Hall) who will show a power-operated tilting furnace which is claimed to effect manpower saving, being poured by one operator. A remote control device permits three furnaces to be operated by one man.

Philips Exhibits at Olympia.—Philips Industrial (Philips Lamps Ltd.) will exhibit a range of welding equipment (arc and resistance), magnetic filters, and industrial rectifiers on Stand No. 10 Row F.

ATOMIC ENERGY CENTRE

Work to Begin in Lake District

SELLAFIELD, in the Lake District, is to be the site of Britain's main atomic energy plant. Announcing this last week, the Minister of Supply (Mr. J. Wilmot) said that the original intention to establish the plant at the Royal Ordnance factory at Drigg had been abandoned. He said that the first experimental pile for the production of atomic energy at Harwell, Berks, would be in operation this year. The Government hoped in time to build there a university of nuclear fission second to none in the world. Meanwhile, the Springfield factory for the production of pure uranium from pitchblende was proceeding smoothly, and work was about to begin at Sellafield. Asked what was the difference between Harwell and Sellafield, Mr. Wilmot said: "It is largely a question of size, scope and variety. Harwell is a general research establishment, with plant of pilot size. The new plant to be erected at Sellafield will produce fissile material for use in atomic energy work generally."

Sir Ralph Glyn, in the course of the debate on the Ministry of Supply estimates, said that the Harwell station was in his constituency, and, although the highest priority was being given to the work, they were eight months behind schedule. "It is known locally as 'the home of rest,'" he said. "Whenever one goes there there are certainly a large number of men resting on spades."

Mr. A. Woodburn, Parliamentary Secretary of the Ministry, admitted that the Government was spending far too little because of present conditions of labour and material shortage. They were putting every effort into getting atomic energy developed as soon as possible because in 10 years' time it might make all the difference to the industrial life of the country.

Bus/Chemical Lorry Collision.—Fumes converted a Morecombe-bound motor bus into a gas chamber when it came into collision with a lorry at Clayton-le-Dale, Blackburn, on July 23; carboys of concentrated bleaching fluids were shattered on the road. Passengers had to leave by the emergency exit owing to jamming of the door. Women soaked in the corrosive fluid removed stockings and clothing to get relief. Altogether forty passengers were treated for burns and other injuries, five children being among those detained in Blackburn Infirmary. Both drivers escaped with bruises.

The Board of Trade announces that the selling price of Oiticica oil is now £175 per ton net, ex store.

American Chemical Notebook

From Our New York Correspondent

RECOGNITION of chemical industry's need of fuller supplies of certain grades of coal as raw material without having to compete in the fuel market is the decision of the Eastern Gas and Fuel Associates, of Pittsburgh, Pa., to open its own mine in Boone County, West Virginia, to gain high volatile coal for its chemical and coking plants. Initial production by some 300 miners will be about 2000 tons daily. Following more than a year of exploration, a large acreage of land has been leased and will be mined in a seam which outcrops about 150 feet above the floor of the valley. The mine is expected to go into operation about October, 1948, and as it is developed and fully mechanised it is expected ultimately to produce about 4000 tons of coal daily. A new town site, well away from the mining operations, is now being developed where 70 new homes for miners will be built as soon as possible. Community facilities will include pavements, electric utilities for homes and streets, sewage and water systems. Much of the equipment necessary for the initial operation of the mine has been on order for some time, so that no delays are anticipated due to the present shortage of mining machinery. The need for greatly increased supplies of by-product coal was cited recently by H. B. Baird, vice president of sales for the Coal Division of Eastern Gas and Fuel Associates. "It is the opinion of producers that such coal will be extremely scarce for years to come." Mr. Baird predicted "The many by-products of coal, with their ever-increasing scope will, in a relatively short space of time, make it too valuable to burn as ordinary fuel."

* * *

Just before the war, according to a report released this week by the U.S. Department of Commerce, the Oppau plant of I. G. Farbenindustrie developed automatic infra-red gas analysers to detect carbon monoxide, carbon dioxide, or hydrocyanic acid in concentrations as low as 1 in 100,000. Called the "Uras," the instrument can discover the presence of a simple chemical compound in a gaseous mixture and measure its concentration by irradiating the mixture with infra-red light of a wave-length that only the compound can absorb. The resultant thermal expansion of the mixture is an identification of the compound and the amount of expansion a measure of its concentration. I. G. Farben manufactured about 400 of the analysers and used most of them for analysing flue gas, determining the amount of methane in air, ethylene in ethane, and acetylene in ethane and ethylene, and for similar purposes. Gases having close infra-red absorption bands cannot be identified with certainty. The report, No. PB-48678, "A Survey of the Use of Infra-red Spectra in Chemical Analysis in Germany," is available from the Office of Technical Services, Washington 25, D.C., in photostat form for $15, in microfil for $5, and consists of 215 pages including illustrations and copies of blueprints of principal sub-assemblies and of some smaller parts.

* * *

The American Institute of Chemists has just issued a formal statement approving the establishment of a National Science Foundation by the United States as a medium through which basic scientific research should be supported by the federal government. In making its approval public, the Institute listed the following reasons for its stand: (1) Certain problems are so far-flung in scope that they require the broad resources and the facilities for co-ordination that the government alone can provide; (2) if the government does not step in to attack these problems on many fronts, the small-scale efforts put forth by private research may prove to be ineffective; (3) absence of early profit reduces inducement for industry to engage in the type of problem that is important but neglected for monetary reasons; financial returns invariably lag far behind the inception of basic research. Commenting on the government's atomic energy research, the Institute's statement noted that "In a matter of a few years a battery of research workers compressed many years of experimentation into successful reality. This story can be repeated in other directions, including those problems which lie untouched for want of financial returns. All research workers," declares the Institute, "know that the best kind of research work grows in free territory—free from pressure, special interests, and politics."

* * *

The U.S. Manufacturing Chemists' Association has just published chemical safety data sheet SD-12 on carbon disulphide, the twelfth in the series of chemical product safety manuals being prepared by the association. Designed for supervisory staffs and management, the manuals concisely present essential information for the safe handling and use of chemical products. Each manual sets forth the important physical and chemical properties of the product; usual shipping containers and methods for their unloading and emptying; container storing and handling; requirements for caution labels, and recommended personal protective equipment. Health hazards and their control are covered authoritatively in a section prepared by the Medical Advisory Committee of physicians and toxicologists. These publications may be obtained at 20 cents per copy from the association at 608 Woodward Building, Washington 5, D.C.

* * *

A high styrene—a low butadiene copolymer called Good-rite Resin 50—was announced this week by the B. F. Goodrich Chemical Company which stated that it was available in commercial production quantities. Laboratory tests indicate that the resin is well adapted for applications such as electrical insulation, protective coatings and for injection moulded articles. Sold as a white powder, the new resin has a specific gravity of 1.045 and may be softened and sheeted on a mill at temperatures of 150° to 225° F., or injection moulded at temperatures of 380° to 440° F., using a 45 second moulding cycle. Unusual impact resistance, excellent resistance to water absorption, increased hardness and good electrical properties are some of the characteristics which it is claimed this new resin imparts to natural and synthetic rubbers. Used in small amounts, as a compounding ingredient for GR-S or natural rubber, Good-rite resin, it is stated, up to certain limits gives increased abrasion resistance, modulus and resistance to cut growth. Hysteresis and compression set are generally increased and rebound is decreased.

* * *

A new product with properties not previously available in a thermoplastic material is now in commercial production by the same company. Designated Geon polyblend 500 x 503, the new product is the first in a series of colloidal blends of Geon polyvinyl chloride resin and Hycar nitrile rubber polymers. Geon polyblend has been especially designed for extruding and calendering and is well adapted to embossing and press-polishing operations. This points to wide applications of the new product in the upholstery, shoe, electrical and packaging industries. In the electrical industry, polyblend will serve as an excellent covering for cables containing vinyl insulated wires since there is no danger of plasticiser "migration." The characteristics of vinyl elastomers are achieved in Geon polyblend with no liquid plasticiser. This elimination of plasticiser transfer is also important to food packaging and adhesive applications. The compounding, processing and fabrication of polyblend have characteristics common to both vinyl plastic and nitrile rubber. The stock can be easily processed in either a hot or cold mill, where it forms a smooth sheet after only one "pass" and, unlike rubber, does not require a "breakdown" period. It is interesting to note that at temperatures between 310° and 330° F. the transition of the Geon polyblend from a rubber-like polymer to a vinyl plastic becomes complete.

* * *

Another notable aid to injection moulding, as well as continuous extrusion, is the new cellulose acetate propionate plastic which the Tennessee Eastman Corporation, of Kingsport, Tennessee, has just made available, under the name of Tenite III. The third of the cellulose ester plastics which this firm has produced—this material should greatly increase the adaptability of the process. In comparison with Tenites I and II, the new product has superior impact strength and greater dimensional stability than Tenite I and less odour than Tenite II.

* * *

Earnings of most U.S. chemical undertakings continue to show increases which would have been phenomenal in more normal times and when prices were more stable, notwithstanding the sharp rise in operating costs. The American Potash and Chemical Corporation, for example, have just reported that in the first quarter of this year earnings were equivalent to $1.07 a share (against $2.87 on the whole year's working in 1946) and sales have increased so markedly that present output is bespoke for five years to come. Big expansion, including a new soda ash and borax plant, is being made. United States Industrial Chemicals, Inc., set up a new record by increasing sales 45 per cent to $69.7 million in the year ended last March. Net income was $3.5 million, equivalent to $7.19 per share, against $1.83 million the previous year. Net profits of the Westvaco Chlorine Products Corporation in the period ended June 30 were more than doubled, at $1.26 million, and the Illinois Zinc Co. and its subsidiaries in nine months to June 30 secured net profits of $462,475, against $104,735 in the preceding nine months. The greater activity in the zinc industry is confirmed by the report issued by the American Zinc Institute that output of all grades of smelter in June was 70,990 short tons, as compared with 58,812 short tons a year before. Testimony of the rising production costs is the announcement by one of the largest chemical companies in the country—the Dow Chemical Co., of Michigan, that tentative agreement has been reached in providing an average wage increase of 8 cents an hour for 5000 employees.

* * *

The United States should remove, or in any event, reduce the existing import duty on refined nickel in the forthcoming trade negotiations with Canada, says a statement by the International Nickel Company.

METAL PURCHASING COMMISSIONS ATTACKED

M.P.'s on Inflated World Prices

GOVERNMENT control under the bulk buying system of non-ferrous metals and the hampering effect upon the scientific instrument industry of inadequate steel allocations were among the principal grounds of spirited attacks on the activities of the Ministry of Supply by Mr. Oliver Lyttelton, Mr. Brendan Bracken and others in the course of the debate in the House of Commons last week on the Civil vote on the Ministry of Supply Estimates.

Mr. Lyttelton (who was Controller of Non-Ferrous Metals in the previous Government), reminding the House that the Ministry had the responsibility of supplying the country's requirement of some 30,000 tons of copper a month, claimed that as the largest buyers of copper in the world, the Ministry "are seen coming a mile away and have contributed by that fact to the huge rise in copper prices." At the end of the war the price of copper in this country was £62 a ton. It was now £132, having recently been £137. In a free market a £1 rise in copper was very exceptional. Latterly the price "had gone up in a series of jumps." In the last eight or nine weeks, the American manufacturer has been able to obtain his copper at a much lower price than his competitor in the British Isles. Today, he can buy electrolytic copper at about 21½ cents per lb. or £119 10s. per ton. He can get copper for forward delivery, three months hence, at about 20½ cents per lb., which is about £114 per ton. The price of electrolytic copper in this country is £132 a ton. The difference in the supply price of copper is £12 10s. in favour of the American or the buyer of any other country who uses the free market, or £18 per ton if he wishes to cover his copper purchases forward. All that is due to bulk buying.

Competing with the U.S.A.

The Minister of Supply (Mr. J. Wilmot), replying, said that instead of an embarrassing surplus of non-ferrous metals at the end of the war, which had been generally anticipated, they had run into a very severe shortage.

"I suggest," he continued, "that the continuance of centralised purchasing and distribution has enabled us to maintain a reasonable supply of non-ferrous metals to industry in a time of acute shortage. This applies to all the metals, except, recently, to lead. In the case of lead, there has been such a stringent world shortage that no efforts have availed to offset it. We had to operate in non-ferrous metals in the most abnormal conditions. The removal of controls in the United States of America brought the United States in full force as an enormous buyer in the world's markets."

"A year ago, foreseeing the continuance of the copper shortage, we arranged for the refinement in the United States, Canada and Belgium of large quantities of Ministry owned rough copper and scrap brass. We did that because it is quite impossible to get that work done here. These purchases also involve a very large expenditure in dollars and other hard currencies. I submit to the right hon. gentleman that, until the overseas financial position is much clearer, we must continue with bulk buying, and that there would be no purpose at all in reverting to private trade, and reopening the London Metal Exchange, if dealings were not possible owing to the stringency of supplies or to currency restrictions."

"Heath Robinson Contraption"

Mr. Brendan Bracken claimed that impartial experts overseas, surveying our "Heath Robinson contraption" for the bulk purchase of metals, often said: "Why does your crazy Ministry insist on putting prices up against itself? Your bulk purchasers are estimable men, but they know little about markets." Mr. Bracken added: "I think it is also right to say that the magical touch of the Ministry's bulk purchasers is transforming base metals into precious metals; I congratulate them on that strange achievement."

A Tragedy to Industry

Earlier, Mr. Lyttelton had directed the Minister's attention to the fact that the scientific instruments makers in this country given 5000 tons of steel a year could produce goods worth about £50 million. Its labour force had increased from 32,000 in 1935 to 74,000 today. Even on its diminished steel allocation of 250 tons a quarter its current production was running at over £16 million annually.

The Minister, in the course of his reply, said: "It is, of course, a tragedy to British industry that at the very time when it could make an unexampled use of an extra supply of steel it has to be limited in this way. But I would like to ask the right hon. gentleman, would he abolish the allocation machinery and leave it free for all, a scramble with no price control, no allocation, devoted to whatever purpose for which those who would pay the highest price would be willing to use it?"

Metallurgical Section

Published the first Saturday in the month

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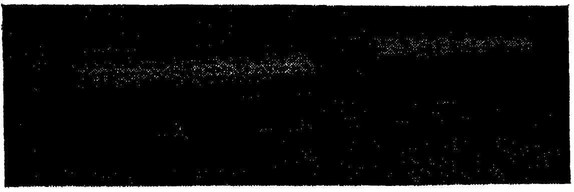

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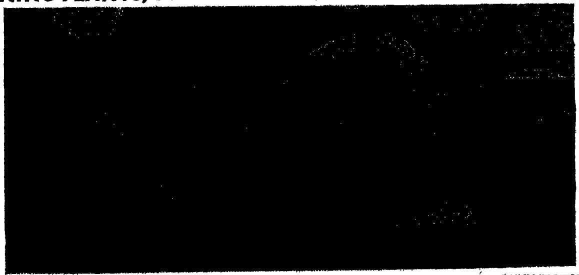

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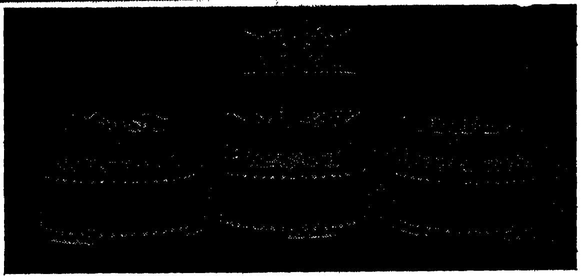

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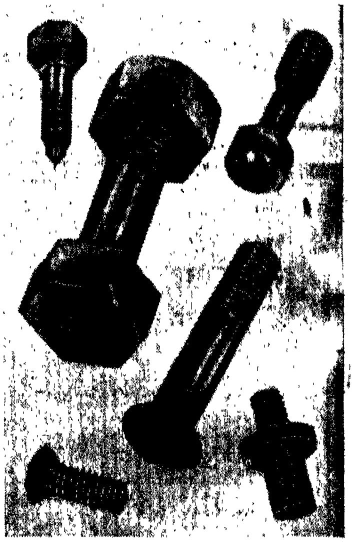

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Metallurgical Section

2 August 1947

PRECIPITATION HARDENING—V*

by L. SANDERSON

WE have earlier indicated that quench aging is the result of a modification of the characteristics of mild steel when it has been subjected to a severe quenching operation as the concluding stage in heat treatment. The extent to which it takes place is governed solely by the percentage of carbon in the material, and the structural condition is precisely that obtaining when ordinary hardening by precipitation occurs, the constituent precipitated being in this instance cementite.

There is, as yet, no agreement among metallurgists as to the precise correlation between carbon content and maximum hardness, but the majority view appears to be that 0.06 carbon gives the greatest degree of hardness, while if the carbon content exceeds 0.14 per cent there may not be any perceptible hardening effect.

Commercial Application

The only commercial use made of quench aging in relation to low carbon steel is in making spring wire such as is employed in upholstery For other commercial purposes, the maximum hardness increase being only about 50 V.P.N., and the decrease in ductility being considerable, the effect is insignificant. It is commonly held that the decline in ability to withstand impact shock experienced when medium carbon steel is gradually cooled after it has been subjected to a tempering operation is also caused by quench aging. This effect is essentially that of temper brittleness.

The steels that can be aged have certain advantages. In the first place, because they acquire hardness and lose ductility when mechanically worked in the cold state, they possess improved machinability, the chips being readily broken off as a result of their brittleness, which means, among other things, that heat is carried away more quickly from the nose of the cutting tool. The larger the grain structure of the steel, the greater its machinability, and such coarse-grained steels are more responsive to aging. In fact, there seems to be a general correspondence between the conditions of coarse grain, machinability and response to aging. Powerful deoxidation appears to produce steels of fine grain, which are, in consequence, harder to machine and less sensitive to aging.

Steels that do not age, however, have other properties that are of commercial value. They have a greater ductility and tenacity, a greater damping capacity, and can resist plastic strain without cracking more effectively (the property known as "crackless plasticity").

From the practical point of view, aging and the modification of properties to which it leads are chiefly significant in relation to strain aging and its influence on the deep drawing and stamping of low and medium carbon steel sheets. In these, the ultimate stage in manufacturing operations before drawing begins is usually a light cold rolling to remove the yield point and thereby minimise the formation of stretcher strains. If the sheets are not put into service at once, aging will bring about a restoration of the yield point, and the liability to stretcher strain formation will recur.

When ordinary carbon steels, unalloyed, are subjected to a quenching operation, the hardness thereby produced is not generally considered to be an example of precipitation hardening, but in fact it constitutes a perfect instance of this form of hardening. The first stage is an allotropic modification of iron, which renders an extraordinary degree of super-saturation possible. Then comes a stage commonly known as critical dispersion, which is found directly on completion of the quench, and may be the minutest possible unit of precipitate.

Normal Process

The tempering operation applied to steels so quenched sets up a slow softening of the material, and this corresponds to over-aging in other systems. Let us consider what happens when ordinary ageing produces a hardening effect in steel. First, the quenching operation leads to the formation of a supersaturated solid solution, possessing stability at elevated temperature. Next follows the structural precipitation of a secondary decomposition product when the steel which has been quenched is reheated, after which come coalescence and softening. It should also be noted that isothermal tempering responds to identical laws. It is therefore evident that there are strong analogies between the two processes.

There are, of course, discrepancies between the treatment of steel and the ordinary aging treatment. For instance, here is a discontinuity in the law of lowering of transformation points at $A_r{}^1$ as the speed of cooling rises, by reason of the allotropic modification of iron. Tempering of steel is more intricate, because when high carbon and alloy steels are quenched, martensite and austenite are found, while a number of elementary reactions may be experienced.

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* Previous articles appeared on February 1, April 5, June 7 and July 5.

The discovery of the super high speed steel and certain other tool steels was speedily followed by the recognition that a considerable improvement in cutting properties could be achieved by a secondary hardening operation. The tendency today is to regard this increase in cutting power, resulting entirely from an increase in hardness, as the consequence of precipitation hardening, the precipitate being carbides other than those of Fe_3C.

Other Steels

Steels containing copper can be precipitation hardened, as long as the copper percentage lies within the range 0.4 to 3.5 per cent. The effect is produced by heating to a temperature in excess of 833° C., and then quenching, followed by tempering at temperatures above 400° C. for period up to a maximum of about 15 hours. The greatest hardening is developed with steels containing 1.5 per cent copper, which show a yield point of about 40 tons per sq. in., ultimate tensile strength of 49 tons per sq. in., elongation of 23 per cent, reduction of area of 55 per cent, and Brinell hardness of 223, these figures being produced by reheating for four hours at 500° C.

Quenching is not essential with these steels, because ordinary cooling suffices to produce the required structural condition as long as the speed of cooling is in excess of 2° C. per minute.

Precipitation hardened copper steels are, however, lacking in mechanical strength as compared with ordinary quenched and tempered copper steels, so that the process is rarely used save for castings of complicated form, which would be liable to crack if quenched. The precipitation hardened copper steels have the advantages of dispensing with the need for quenching, air-cooling being sufficient; absence of mass effect, so that it is possible without difficulty to treat steel of a diameter up to 11 in.; internal stresses are relieved without any softening of the material; and the steels have a higher corrosion resistance as far as atmospheric corrosion is concerned.

Treatment of Alloys

Magnet alloys of the Alni, Alnico and iron-cobalt-molybdenum types can be precipitation hardened, the most satisfactory method being to employ a high solution temperature, quench in oil or air, and follow with a precipitation treatment.

Invar and Elinvar, alloys used extensively where materials possessing low thermal expansivity are required, can also be precipitation hardened. Invar has to have approximately 3.25 per cent of titanium added to it to make it hardenable, and Elinvar also requires titanium to the extent of about 2.8 per cent. In both instances the hardening agent is believed to be Ni_3Ti.

Lead calcium alloys, of considerable value for storage batteries, are notably hardened by heat-treatment for 18 hr. at 100°C., and ageing at normal temperature. The calcium content is about 0.04 to 0.10. Standard silver as used in coins can also be precipitation hardened by heating it to 770° C. for half an hour, quenching, then tempering at 300° C. for another half hour, which trebles the hardness as compared to that of the quenched metal.

In conclusion, it is reasonable to suggest that eventually and at no remote period the metallurgist may be able to determine in advance precisely what characteristics any specific alloy of known composition will possess in any particular condition, which will entirely eliminate the necessity for complicated and protracted research.

[*Concluded.*]

German Iron Council

The liquidation of the various groupings in the steel industry which is at present in progress in Western Germany, has, according to recent reports, led a number of iron and steel firms to take the initiative in suggesting the establishment of an Iron Council, to be composed of eight members, drawn in equal numbers from the employers and trade unions. This council would have advisory functions in connection with the reconstruction of the iron and steel industry of Western Germany, and it would submit proposals of its own to the Military Government and to the German administrative authorities.

It appears that this suggestion originated within that group of industrialists, belonging to the powerful steel groups, which hopes to secure a stronger influence in the reorganisation of the industry. They point out that the new companies which were separated from the old groups, enjoy public subsidies which are not granted to the remaining enterprises. They fear, moreover, that any debts outstanding will have to be borne chiefly by the latter.

Co-op. Enters Fertiliser Field.—The firm of Messrs. James Wyllie and Sons, chemical fertiliser manufacturers, of Dumfries, Stranraer, Garleston, and Port William, has been acquired by the Scottish Co-operative Wholesale Society. This marks the entry of the S.C.W.S. into the fertiliser field as manufacturers and distributors on a large scale.

POWDER METALLURGY—II

First Results in Industrial Use

THE section on porous metal components (Section E of the Special Report No. 38, 1947, of the Iron and Steel Institute) contains much of interest; first, on porous bronze bearings which have long been known; and, second, on filters and aircraft de-icing equipment which are definitely new developments.

Carter and Metcalfe (Powderloys, Ltd., Coventry), who contribute the paper on porous bearings, give a brief description of the usual methods of manufacture; *e.g.*, sintering compacts made from a mixture of copper, tin, and graphite powders, with or without addition of a volatile compound, at temperature of 700-800°C. for 10-60 minutes. W. D. Jones recommends a double heat treatment, first at 400° and second up to 800°C. After sintering, the bearings are impregnated with oil in one of various ways and then " sized " as usual.

Study of Temperatures

An attempt is made to correlate the structure of these bearings, determined by X-ray diffraction, with other properties. Copper-tin-graphite mixtures were sintered, and results obtained by various combinations of compacting pressure and sintering times and temperatures were compared with the properties of the bearings examined. The peritectic reaction at 738°C. between the alpha solid solution and the liquid was found to be of prime importance in the usual sintering cycles, giving rise to sharp difference in structure and strength of bearings. It was thus possible to decide whether the sintering temperature used in manufacture had been below or above 800°C.

Sintered Products, Ltd., Sutton-in-Ashfield, have specialised for some time in the manufacture of highly porous metal compacts for various purposes including more particularly filters; and the paper by C. E. Sinclair describes the principal characteristics of these compacts. Considerable progress has been made both in this country and the U.S.A., but little information has hitherto been published; although the present writer in his patent review (THE CHEMICAL AGE, January 4, 1947) included one or two references to this subject.

In order to obtain the desired control over filtering efficiency it is necessary to use powders composed of graded spherical particles. Examples are given of the flow, and pressure drop relationships of porous filters produced from such powders, together with micrographs of the pore size and shape.

Owing to high porosity, mechanical properties are low; but the compacts are ductile and have a shock resistance far higher than that of ceramic filters. The powder commonly used is of bronze formed by an atomising method in which a thin stream of falling molten metal is struck by a jet of air. Micro-photographs of the structure of Porosint are shown, and some of its special uses briefly noted, including (a) filtration or removal of unwanted material; (b) modification or adjustment of flow; (c) mixing of gases and liquids, as in yeast manufacture. The absorptive properties of the material are also often useful.

De-Icing Equipment

The aircraft liquid de-icing equipment, described by T.K.S. (Aircraft De-icing), Ltd., resulted from the urgent need in 1940 for a really satisfactory method of dealing with a serious impediment to winter and high altitude flying. Briefly, the device consists of a porous metal distributor, with a sintered copper-nickel-tin compact as the porous medium. The construction and operation of this system are described in detail, with some notes on practical application, from which it appears that ice at least 2½ in. thick can be removed. Practically all new civil aircraft are now fitted with this device. It should be added that Dr. W. D. Jones was one of the earliest to realise the possibilities of metal powder in this direction, and he has one or two patents in his name.

Before leaving the subject of porous metal components, mention should be made of paper No. 23 in Section F, by W. H. Tait (Glacier Metal Co., Ltd.), describing powder metallurgy bearing materials, with particular reference to plain bearings and thrust washers and to the unique qualities of metal powders of the copper-lead type for this purpose. Both porous and non-porous self-lubricating structures are described, with the usual steel backing for the powdered compact. For heavy loadings, tin powder is included in the mixture. The author thinks that the possible field for bearing materials is immensely widened by powder metallurgy, affording considerable scope for research with different powder mixtures and lubricants, under the most varied conditions.

Iron and Non-Ferrous Metals

Section F on sintered components may be roughly divided into sub-sections on (a) iron and iron-carbon (or graphite) mixtures and compacts; (b) iron-copper mixtures, copper powders; (c) aluminium and miscellaneous non-ferrous components; and (d) German progress.

In their paper on the properties of certain iron powder compacts, J. P. Burr and W. Clarke, of New London Electron Works, Ltd., concentrate mainly on the effect of length of compact on density of electrolytic iron powders compacted under various pressures; also the effect on the tensile properties of such compacts of adding 1 per cent of stearin. Values for the probable pressure losses at the centres are tabulated. The effect of stearin was to reduce considerably the ultimate tensile strength and elongation of the straight sintered compacts; but the difference was less marked with the coined specimens, and when the compacts were re-pressed and re-sintered there was no difference in tensile strength, although elongation remained less with the stearin mixture. In the latter case, too, ejection pressure was reduced from 25 to 15 tons/sq. in. and ejection was more easy and smooth.

Iron-Carbon Alloys

The paper on iron-carbon alloys by J. A. Judd (British Piston Ring Co., Ltd.) is of fundamental interest and important, for it deals with the production on a commercial scale of sintered steels and their products noting the higher density and strength, excepting iron-copper alloys and high density pure iron parts, which are excluded from this comparison.

Dr. Judd discusses methods for increasing density and an essentially perlitic structure, and describes three ways by which sintered steels can be obtained. He emphasises that commercial considerations must limit pressures to 50 tons/sq. in. and temperatures to 1150°C. The three available methods are those using: (a) pre-alloyed steel or cast iron powder (b) mixtures of either pure or soft iron powder with graphite powder, forming iron carbide by sinterings; and (c) mixtures of either pure iron or soft iron powder with a smaller percentage of an alloy containing iron carbide. These are described in detail with their respective advantages and limitations.

It is concluded that, for the higher carbon alloys (hypereutectoid and graphitic steels) there is some advantage in mixtures of iron powder with iron carbide and graphite powder, since the iron carbide liquefies at sintering temperature, thereby strengthening the bond and improving physical properties. In this case, too, alloying elements may be incorporated which normally diffuse in sintering only with great difficulty.

Applications of this technique to production of aircraft piston rings are indicated; but it is clear that these powder metallurgy steels should have many important and varied uses. British Piston Ring Co., Ltd., already have numerous patents to their credit. The paper is of special value, in that it is based on actual large-scale manufacturing technique. The figures quoted are taken on actual ring blanks, and both elasticity modulus and ultimate strength were tested according to Air Ministry specifications for cast iron rings. The relation of these two factors to density is indicated.

An equally valuable but more general paper on iron-graphite powder mixtures and steel production was presented by R. Chadwick and E. R. Broadfield (I.C.I., Metals Division, Ltd.). This is copiously illustrated with curves and micro-photographs, and deals in some detail with the pressing, sintering, and heat treatment of varous grades of iron powder with graphite additions; the three principal types being (a) electrolytic, (b) charcoal-reduced Swedish, and (c) German Degussa powder. (Degussa = Deutsche Gold- u. Silberscheide Anstalt.)

Although differing appreciably in purity, the various iron powders did not vary much in general properties if they were annealed and fully reduced before use. Graphite additions facilitated rapid and effective diffusion of carbon at 1000°C. or above, forming perlitic structures, with ferrite or cementite, according to carbon percentage. Typical steels could be readily produced, and under suitable conditions could be heat-treated. Graphite additions were of the order of 1-2 per cent and sintering times up to 1 hour were used (at 1125°C.).

In regard to subsequent heat treatment, it was found that the conditions affecting quenching were complex: water quenching proved too drastic for highly porous compacts, and it is concluded generally that effective oil-quenching involves permeation of the porous structure.

Iron-Copper Powders

The same authors have also supplied one of the interesting papers on iron-copper powder mixtures; the other coming from the Armament Research Department at Woolwich. R. Chadwick and co-workers studied effects of variation in particle size, pressure, and sintering temperature on properties of iron-copper compacts containing up to 35 per cent copper. The iron powder was either (a) electrolytic, from ferrous ammonium sulphate solution; (b) reduced from scale of mild steel steel turnings by cracked ammonia; (c) charcoal-reduced Swedish, or (d) American mill scale powder. The copper was either electrolytic or hydrogen-reduced.

Copper and iron form no brittle phases, and it is possible to obtain strong sintered compacts over a wide range of composition, optimum strength and ductility being obtained with a 75/25 iron-copper mixture, at temperatures high enough to melt the copper-rich phase powders finer than 240 mesh B.S.S.

Compressibility was one of the most important factors. Compacts made from the readily compressible electrolytic powders shrink less than those made from the less compressible hydrogen-reduced powders;

but the latter types shrink to a greater extent in sintering, and therefore higher tensile strength and ductility are generally obtained in the products.

The paper from Woolwich also gives results of study of sintered compacts of iron-copper alloys; and here again substantial improvement in tensile strength and hardness, as well as increased scuffing load, are observed with up to 25 per cent copper. The advantage of sintering above the melting point of copper is shown in the microstructure. Improvement generally is greatest with copper of small particle size, but this may not be true with coarse particle irons.

High density compacts are obtained by impregnation of pressed iron compacts with molten copper. There is close relation between tensile strength and equivalent density (referred to by J. A. Judd), irrespective of the method of manufacture; but for constant porosity maximum strength was obtained with about 10 per cent copper.

It is concluded that the essential purpose of copper additions is to increase particle cohesion; and modifications in composition or sintering technique which aid this process will also improve mechanical properties, if the copper addition is not too great, while sufficient to confer its low strength to the compact.

Comparative Study

I.C.I., Ltd., Metals Division, in recent years have devoted much time and research to the study of copper powders. Cook and Pugh (paper No. 24) point out that, although prior work in this field has contributed useful information, there has not been a critical comparison of powders of different types. They have endeavoured to make this comparative study, and have investigated copper powders of varied origin, studying behaviour in pressing and sintering in relation to particle shape and particle-size grading or distribution.

Three different types of copper powder: electrolytic, reduced, and chemically precipitated, were examined in regard to physical properties, including compressibility, dimensional changes in sintering, as well as tensile strength and ductility of sintered products. A full discussion of results is well illustrated with curves and microphotographs.

Brass and bronze engineering components by powder metallurgy are dealt with in paper 25, by J. W. Lennox (Sintered Products, Ltd.). Methods and properties in respect to a 70/30 brass and a 90/10 bronze are described in detail, together with some of the resulting components made by mass production methods.

One of the principal difficulties in producing aluminium powder is probably oxidation, and in this paper (No. 26) R. L. Bickerdike, of the Royal Aircraft Establishment, Farnborough, reviews methods of obtaining oxide-free powders, and describes experiments on the hot- and cold-pressing and sintering of copper-aluminium powders. As was to be expected, the pressure and sintering temperature used were found to have a critical effect on the properties of sintered compacts. Test pieces in the form of discs were employed and results are presented of microscopical examination, density and hardness measurements, and tensile test.

German Progress

Of the two papers on German progress in recent years, the first by C. J. Leadbeater, of the Armament Research Department, Woolwich, is noteworthy for the very comprehensive list appended of BIOS and CIOS reports dealing partly or wholly with powder metallurgy and its applications in Germany. The author briefly surveys these, including types of equipment and its applications in Germany.

Several significant developments occurred in powder production. The flake powder industry was reorganised and re-equipped for producing pyrophoric aluminium (13,000 tons/year) while production of iron powder exceeded 3000 tons/month. Disc- and air-atomisation methods for iron powder yielded satisfactory grades of product, increased rates of output, and appeared likely to supplant the mechanical Hametag process with its relatively low rate of output and high capital and maintenance costs. Molybdenum powder of greater purity was obtained by distilling the oxide before reduction.

Only a few types of components, such as driving bands, bearings, and filaments, were made on a commercial basis, although many, chiefly of dense steel, had reached the development stage. An ingenious arrangement of sprung sub-multiple punches had been devised to attain a uniform compression-ratio in components of complicated shape. Hydraulic and mechanical presses were in general use, with multiple die-stations for pressing small bearings and bullet cores.

Further details of driving bands made from sintered iron are given by W. Ivory, also of the Armament Research Department, together with a general review of German war-time production of iron powder, of which 93 per cent was used in [illegible] production of driving bands. Some of the principal advances in technique during the war are indicated, including continuous resistance furnaces of the molybdenum wire wound type, hard metal linings for dies, study of grain characteristics and their significance, and introduction of new processes, especially the RZ in which atomisation was used, with high carbon steel as raw material.

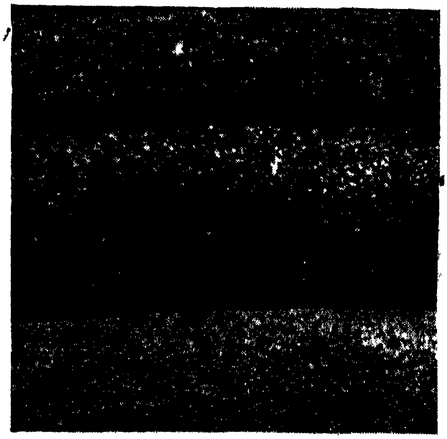
[*The first part of this review was published in our issue of July* 19.]

Electroless Plating on Metals by Chemical Reduction

A NEW method for plating nickel and cobalt on metal surfaces without the use of electric current, known as electroless plating, and brought about by chemical reduction of a nickel or cobalt salt with hypophosphite in hot solution has been developed by Abner Brenner and Grace E. Riddell of the U.S. National Bureau of Standards. The reaction is catalytic, and under the prescribed conditions of concentration and *p*H, no plating occurs unless certain metals, such as steel or nickel, are introduced in the bath. The reduction then occurs only on the surface of the immersed metal with the production of an adherent coating of 93 to 97 per cent purity.

Photomicrographs of deposits obtained in this way show both a laminar and a columnal structure, similar to bright nickel electrodeposits. The electroless deposits are of good quality—sound though brittle, and unusually bright. Since they can be made as hard as tool steel, the method may prove useful where hard, wear-resistant surfaces are required, as in bearings. The process is particularly applicable to the plating of recesses, irregular-shaped objects, and enclosed areas such as tubes, where a centred internal electrode with special current leads would be needed in electroplating.

The equipment is simple, more easily assembled than that required for electroplating and no generators, rheostats, special racks or contacts are required. Small parts which cannot be barrel-plated economically are readily plated by the electroless process if suspended by a string or in a bag affording ample exposure of the metal surface to the solution. There is no need of constant motion, as in barrel plating, since current distribution is not involved.



While electroless deposits of cobalt and cobalt-nickel alloys have been obtained only from ammoniacal solutions, nickel can be deposited from either acid or alkaline solutions. The reactions, requiring a temperature above 90° C. are given in the following equations (in which cobalt may be written for nickel):

$$NiCl_2 + NaH_2PO_2 + H_2O \rightarrow Ni + 2HCl + NaH_2PO_3$$

or $NaH_2PO_2 + H_2O \rightarrow NaH_2PO_3 + H_2$

The first reaction is the important one, resulting in the deposition of nickel; the second reaction tends to lower the efficiency of the process through oxidation of the hypophosphite.

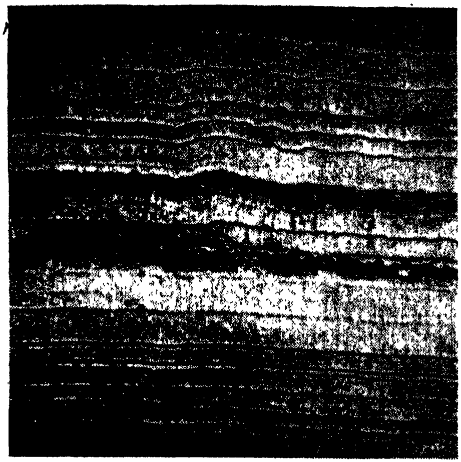
A unique feature of the electroless process is the catalytic initiation of the reaction by the following metals: Iron or steel, nickel, gold, cobalt, palladium, and aluminium. Unless one of these metals is introduced into the solution, no reaction takes place. Once started, the reaction continues at the metallic surface and only rarely occurs in other parts of the bath. For this reason, the containing vessel is of glass, plastic, or other non-catalytic material.

Objects to be plated can be cleaned by any of the accepted procedures and given an acid dip before being suspended in the hot solution. The rate of deposition is about the same as in barrel electroplating, ranging from 0.0002 to 0.0008 in. per hour, depending on the type of solution used. During the process, the *p*H is kept within a certain range, and if the operation is of long duration, the nickel salt and hypophosphite are replenished at regular intervals.

The composition of the plating bath may vary within rather wide limits. Suggested solutions are given in Table 1.

In addition to the metal ions and hypophosphite, the alkaline solutions contain (1) hydroxycarboxylic salts and ammonium salts to prevent precipitation of the metal salts, and (2) certain alkalis to regulate the *p*H. In the acid nickel solutions, organic acids are used as buffers.

Electroless plating on non-catalytic metal surfaces may be accomplished in two ways. If a film of palladium or rhodium of nearly monatomic thickness is first applied by chemical replacement on a non-catalytic metal, deposition of nickel or cobalt will occur on the activated surface. Electroless plating of copper may be carried out in this way. A second method of initiating the reduction is to bring a less noble metal, such as iron or aluminium, in contact with the non-catalytic metal while it is immersed in the hot electroless solution. Once the process has been started, it continues because of the catalytic action on the initial deposit.



As formed, the electroless nickel deposits are brittle but become ductile when heated. These deposits are harder than the ordinary electrodeposited nickel, and upon heating their hardness is still further increased. This is in contrast to the behaviour of "hard" electrodeposited nickel, which has high initial hardness but softens upon heating. The hardening may be explained as "precipitation hardening," probably of phosphides.

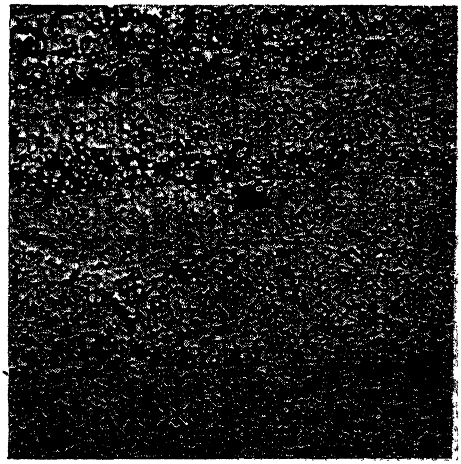
The adhesion of the nickel deposit to mild steel is such that it cannot be flaked off by bending, but on high-carbon steel this property is less satisfactory. In salt-spray tests on steel coated with 0.0002, 0.0005, and 0.0001 in. of electroless nickel, in comparison with similar panels coated with electrodeposited nickel, the protective value of the two types of coatings was virtually the same. However, the electroless cobalt does not compare so favourably with electrodeposited cobalt.

The yield or efficiency of the reduction based on the decomposition of hypophosphite is 37 and 66 per cent for nickel and cobalt, respectively. About 2 grams of nickel or nearly 4 grams of cobalt are reduced by 10 grams of sodium hypophosphite.

TABLE 1

Suggested Compositions for the Various Electroless Solutions

	Nickel			Cobalt-Nickel
	Alkaline g/l	Acid g/l	Cobalt g/l	g/l
Nickel chloride, $NiCl_2.6H_2O$	30	30	—	30
Cobalt chloride, $CoCl_2.6H_2O$	—	—	30	30
Sodium hypophosphite, $NaH_2PO_2.H_2O$	10	10	20	20
Sodium citrate, $Na_3C_6H_5O_7.5\frac{1}{2}H_2O$	100	—	35	—
Rochelle salt, $NaKC_4H_4O_6.4H_2O$	—	—	—	200
Sodium hydroxyacetate, $NaC_2H_3O_3$	—	50	—	—
Ammonium chloride, NH_4Cl	50	—	50	50
Alkali for neutralising	NH_4OH	NaOH	NH_4OH	NH_4OH
*p*H	8-10	4-6	9-10	8-10
Rate of deposition, mm/hour	0.008	0.015	0.015	0.015
Rate of deposition, inch/hour	0.0003	0.0006	0.0006	0.0006
Appearance of deposit	Bright	Semi-bright	Dull	Semi-bright



CONDITIONS IN IRONFOUNDRIES

IMPROVEMENTS RECOMMENDED

THE result of two years' study of working conditions in ironfoundries by a Joint Advisory Committee under the chairmanship of the Chief Inspector of Factories (Mr. H. E. Chasteney) is the subject of a 34-page report published this week under the auspices of the Ministry of Labour (Report of the Joint Advisory Committee on Conditions in Ironfoundries; H.M.S.O., 6d.).

The main objectives of the committee were to recommend means of securing (1) better amenities and more comfortable and healthy working conditions, (2) improved appearance of ironfounders by greater cleanliness, orderliness and more light and colour, and (3) improved atmospheric conditions. It recommended that a Joint Standing Committee should be formed to keep under continuous review conditions affecting the health, welfare and safety of members.

2000 Foundries

There are in Great Britain (says the advisory committee report) about 2000 ironfoundries differing greatly in size and methods of production and producing castings ranging from an ounce up to approximately 150 tons. Some foundries—particularly in the automobile section of those constructed or equipped for special war purposes—are highly mechanised, while in others—especially the smaller jobbing foundries—methods have not changed appreciably during the last 50 years. There is thus a very wide variation in the circumstances of different foundries and this has necessitated some flexibility in the nature and application of our recommendations.

In common with other old industries, many ironfoundries suffer from being housed in poor premises built in days when too little attention was given to working conditions, and this will remain as a fundamental defect until rebuilding can be undertaken. In order that the deficiencies of the past may not be repeated we have included in this report a section summarising some of the main considerations in this respect which should be kept in mind in the design and lay-out of new foundries.

While questions of methods of production are outside our terms of reference, the committee has an interest in the matter because mechanisation of a foundry often enables problems of dust and fume removal to be tackled much more simply and effectively, besides reducing the amount of heavy manual work to be done. We would therefore welcome an increased use of mechanical aids and a wider adoption of labour-saving devices.

It is to be regretted that in many foundries little attention seems to be paid to "good housekeeping," with the result that heavy equipment is dumped anywhere about the foundry, and materials and gear of all kinds are scattered about indiscriminately on the floors, and the general impression is one of confusion and lack of system. The impossibility in such circumstances of keeping gangways clear, and the litter on the floors adds greatly to the hazards of the work and prevents proper cleaning.

On the other hand, very different conditions are to be seen in foundries where the significance of good housekeeping has been fully appreciated. Mechanisation assists very materially towards securing desirable standards, but it is by no means an essential factor, and some of the non-mechanised foundries are among the best kept.

Owing to the presence of furnaces, stoves and molten metal in ironfoundries, it might appear that the main difficulty in controlling the temperature would be to prevent it from becoming unreasonably high rather than to raise it to a desirable level. Some parts of foundries however, for example, dressing shops, are often remote from such sources of heat; and in foundries where casting is intermittent or is confined to the afternoon, cold conditions may be and often are experienced on a winter's morning, even in moulding shops, if adequate measures are not taken to warm the premises.

Cold Delays Work

During spells of very cold weather it is not uncommon for the commencement of work to be delayed because the sand has frozen overnight and the moulders are unable to manipulate it. In order to make the sand workable it is a common practice to use open fires which frequently produce volumes of smoke and fumes and make working conditions extremely unpleasant. From evidence which we have received, it is clear that the question of securing a reasonable temperature has not received the attention it should have had and that very often the means of heating provided are insufficient and unsuitable.

We are agreed that no open fire should be used for warming a foundry. We also feel that mould driers should not be used for this purpose even though they may be considered suitable for other purposes when used under properly controlled conditions.

After taking into account all the information so obtained and the views expressed by foundry occupiers and managers and heating specialists who were consulted, we are of the opinion that it would be generally practicable to attain a temperature of at least 50°F. at working positions within one hour of starting work. It would, however, in our opinion, be unreasonable to insist on the installation of extra heating equipment for the purpose of raising the temperature to 50°F. on the comparatively rare occasions when the outside temperature falls below 30°F., and we feel that it would be sufficient on such occasions if an inside temperature of not less than 20°F. higher than the outside temperature were obtained.

Some Exceptions

Open coal or coke fires and mould driers should not be used for the purpose of heating rooms in ironfoundries. We are of the opinion that the elimination of open fires from ironfoundries is necessary if the best possible conditions are to be attained, but we appreciate that, although their use can be discontinued in many instances, it may be unavoidable, at present, to use them in certain cases owing to the fact that suitable alternatives are not available. For example, there does not appear to be an adequate substitute for the open fire in the process of "burning" which would satisfy all conditions.

The use of an open fire may also be necessary in heavy foundries for certain operations such as the heating of lifting hooks, the heating of plates or bricks for drying core lifting holes after they have been made up and for the drying of cores which have been damaged and repaired or which require final adjustment to size when closing.

The committee finally recommends that: Every effort should be made to avoid the use of "ordinary open fires" in ironfoundries. The industry should endeavour to develop technique to eliminate their use in those processes in which no suitable alternative is at present known.

Where the exceptional use of an open fire can be shown to be unavoidable, all practicable measures should be taken to protect the persons employed against inhalation of fumes or other impurities and to prevent their accumulating in any workroom. In particular a freshly lighted open fire should not be brought into a foundry while it is giving off visible fumes or smoke, but only after it has commenced to burn brightly. It should be removed from the foundry immediately after the work necessitating its use has been completed.

Designing New Foundries

The commonest method of drying and heating ladles is by the use of a wood or coke fire. During this operation the atmosphere is liable to become thick with smoke and fumes. In our opinion the most satisfactory way of dealing with the matter is to arrange a special ladle drying and heating station at which suitable measures are taken to prevent smoke and fumes from escaping into the general atmosphere of the foundry. Such a station is desirable not only because it facilitates the adoption of these measures, but also because it helps in establishing more orderly conditions by concentrating ladle drying and heating in a recognised place. We consider that such stations should be provided in all new foundries and that every effort should be made to provide them in existing foundries although it is appreciated that this may not be possible in all cases.

Among the many other aspects of ironfoundry work on which the committee recommends changes in procedure are canteens, washing and cloakroom facilities, the introduction of light and colour and reduction of noise, dust and fume, and a number of foundry operations, such as the easing of castings, "knock-out" and dressing operations. There is also a section studying in some detail desirable design and constructional rules for new foundries.

Synthetic Rubber Plans

A drop of two cents a pound in the price of buna-S synthetic rubber, from 18½ to 16½ cents a pound, was announced by Rt. Hon. C. D. Howe, Canadian Minister of Reconstruction. Buna-S, principal product of the State-owned Polymer Corporation plant at Sarnia, Ont., was marked at the new price on June 1. Earlier, Mr. Howe had conferred with members of the Polymer group of directors concerning the recent drop in the price of natural rubber and announced that among the steps being taken in anticipation of the drop in the value of natural rubber was the gradual evolution of the plant as the hub and supplier of a new chemical industry on a very large scale. Buna-S production costs had also been continuously reduced.

Buna-S and butyl were reduced in price last November from 20.35 cents a lb. to 18½ cents. The new price of 16½ cents is more than 19 cents lower than when Polymer first began operations in September, 1943. Price of butyl rubber remains unchanged at 18½ cents a lb.

B.I.F. 1948

The British Industries Fair 1948 is to be held in London and Birmingham from May 3-14 and forms of application for space are shortly to be sent to manufacturers. The Board of Trade urges that the forms be completed upon receipt, and promptly returned in order to facilitate early allotment of space.

French Iron-Ore Mining

THE recently issued report of the French Association of iron-ore mines (Chambre Syndicale des Mines de Fer de France) contains interesting details and figures about the development of this highly important branch of France's extracting industries. Output of iron-ore (in million metric tons), showed a welcome increase in 1946 to 16.2 from 7.7 in 1945, while 13.7 million tons were distributed in 1946 compared with 5.3 in 1945; stocks rose thus from 5.7 to 8.0 million tons. The domestic market absorbed 8.2 million tons, compared with 3.6 a year ago, while exports rose from 1.7 to 5.5, with Belgium and Luxembourg the chief customers, although they took only about one-half of the customary pre-war quantities. Deliveries to the Saar, which was formerly an important outlet, aggregated only about one-sixth of the pre-war level. The following table gives a survey of the development of French iron-ore mining (figures in million metric tons) :—

	1929	1937	1945	1946
Output	50.7	37.9	7.7	16.2
Distribution ...	50.2	38.8	5.3	13.7
Stocks	2.7	1.9	5.7	8.0

The labour force increased last year by 2479 and totalled at the beginning of the current year 24,637 persons. A noteworthy improvement took place also in the output per man, which rose in the Lorraine mines from 4.7 metric tons per underground miner in December, 1945, to 5.5 metric tons in December, 1946.

Low Prices

Although this statistical position is proof of the recovery that has been achieved in France in the teeth of great difficulties, the financial position of the iron-ore mining companies is, according to the annual report referred to above, far from satisfactory. The Government is blamed for this by fixing selling prices which do not cover production costs (claimed to have risen by 45 per cent) resulting in heavy losses to the companies. The Lorraine mines alone are reported to have lost about 600 million francs last year; total losses, since the middle of 1943, are said to amount to no less than 1.7 milliard francs. The companies protest that price increases are granted only after considerable delay; for instance, after wages had been increased by 30 per cent in July last year, prices were not increased until the middle of September, from 174 to 280 francs per ton of Lorraine minette, of which 45 francs have to be paid into a special re-equipment fund. Should total output total 19 million tons for the current year, this fund will receive some 800 million francs. The usefulness of this measure is not being contested, but the report expresses the hope that a more economical working may be achieved in future.

U.S. Aluminium

THE production of primary aluminium in the U.S.A. has shown large increases in recent months. Figures just issued by the U.S. Bureau of Mines show that there was a strong rise in the latter part of 1946, after the strongly marked recession in the previous year, and the total produced in March this year, 53,032 short tons, was the highest recorded since August, 1944. Production in the first six months of 1946 fluctuated between 22,000 and 28,000 tons per month and rose steadily to 50,700 tons in December. After holding approximately the same level throughout January this year, metal production fell back in February to 47,000 tons. The March total represents an increase of slightly more than 6000 tons.

The daily average output of aluminium reduction works in February was 1678 tons, representing 4 per cent more than the average in January, and was the highest for 21 months. The total was lower, because of the shorter working month.

The Civilian Production Administration estimated the year's requirements to be 800,000 tons against domestic production of 550,000 tons. To meet the deficiency 28,665 tons were made available from Government stocks in January and February. In the same period producers' virgin metal stocks rose 6722 tons to 21,444 tons, or scarcely two weeks' current use rate.

Pyrites Residues for Germany

Conclusion of a contract between the Rio Tinto Company and the Duisburg Copper Foundry regarding the processing of 120,000 tons of pyrites residues, to be delivered by the Rio Tinto Company, has been announced by the American Military Government in Germany. In payment for the processing, the German company will receive a share of the products for use by the German export industry. The contract provides for further consignments of pyrites to Germany later under similar conditions.

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IRON IN INDUSTRIAL WATERS—I

By a Special Correspondent

WATERS for industrial purposes are of infinite variety depending upon their source and flow, and contain surprisingly large amounts of impurities such as dissolved gases and atmospheric dust from industrially polluted atmospheres which combine with natural soil impurities collected during flow to create many problems for industrial users.

One of the main gaseous impurities is carbon dioxide which reacts in solution with water to give a weak acid solution of carbonic acid H_2CO_3. One part of water dissolves an equal part of carbon dioxide at 15° C. and the weak acid solution is dibasic forming normal carbonates and bi-carbonates, which fact explains the presence of temporary and permanent hardness in water supplies. Temporary hardness can be entirely attributed to bi-carbonates. The weakly acidic character of a water containing carbon dioxide in solution is important because it increases its solvent power.

Natural water is a solvent that will dissolve traces at least of every substance with which it is brought into contact. This is the real reason why it is so difficult to obtain water in the pure state. Oxides of metals are dissolved to form hydroxides or bases, non-metallic oxides to form acids, while hydrates are formed by the solution of certain salts. Hydroxides contain the hydroxyl radicle OH, and hydrates contain water, OH_2 or H_2O.

Waters having a high carbon dioxide content dissolve iron. In deep well supplies iron is present in the form of ferrous bicarbonate in solution owing to the comparatively large amount of carbon dioxide in this type of water. Surface water may also contain iron, the percentage depending upon its degree of acidity and the nature of the strata along its flow. Iron, which in any proportion can be very harmful to many types of industrial processes, can however be fairly easily removed.

Types of Iron Impurity

When it is remembered that iron forms about 4 per cent of the earth's crust and that the metal in the form of oxides, sulphide, and carbonate occurs frequently in geological strata, it is not surprising that iron in various forms is found in water. All water supplies contain approximately one-twentieth of their own volume of oxygen at ordinary temperatures. Traces of iron in water will therefore form ferrous oxide and ferric oxide, and their presence can be detected in boiler feed-water and in boiler scale by their brownish colour. If large amounts of iron impurity are present, hard composite scales may be formed together with calcium and magnesium sulphates and chlorides. Iron impurity in boiler feed-water is not particularly harmful unless it combines with other metallic salts to form scale. The oxides do not of themselves form scale but do so either in combination with sulphate or chloride impurity. Such scale is harmful because it prevents the conduction of heat from boiler shell in steam generation. In addition a composite iron-containing scale of this type may form a seat of corrosion owing to differential electron affinity as compared with other portions of the boiler shell either not so affected or affected in a different manner.

Effects on Dyes

Any type of iron impurity is also harmful in other respects—discoloration, for example is very undesirable in potable water. Again, in dyeing all types of textiles the presence of iron in even the most minute of quantities may give rise to serious trouble. In wool dyeing, for instance, where the iron may cause trouble by reacting with the chrome compounds used in dyeing, as well as decomposing some types of dyestuff, the highest permissible limit of iron in a water supply is one part per million parts of water. Treatment of woven textiles at any stage, from bleaching to finishing, calls for iron-free water. The slightest trace will cause bad whites in bleaching, the fault being even accentuated if hypochlorites and peroxides are used during the oxidising treatment.

In waters drawn from ponds, lakes or other static storage there will often be found algæic growths of a slimy vegetable character which are nourished by the absorption of nitrogen from the air (atmospheric and dissolved). All contain chlorophyll, the green colouring matter emitted by plants absorbing nutriment. Some of these algæ have also the interesting capacity to absorb or fix iron, from which it follows that if iron impurity is present in the water supply and conditions are favourable to the growth of this class of fungi, the amount of iron passed through for use will be greater than in the algæ-free water. Waters of this class are usually turbid, discoloured, and are characterised by an objectionable smell and taste. Such bacteria can not only utilise the iron in solution but may become lodged in supply lines where they will thrive and increase to the detriment of the processes involved. A particular menace in this respect occurs when the growth become large and are dislodged by the flow pressure.

The *Crenothrix* iron and manganese bacteria are usually associated with waters of this type. All waters containing microbiological growths of the type described may be suspect. When the bacteria have exhausted the iron dissolved in the water, they proceed to extract iron from pipe-lines, etc., by the formation of slimy deposits at bends or other points where the inner surface of pipes may be favourable to the growth. *Crenothrix*, chief of the filamentous or hair-like types is at first colourless, but later matures to a dark brown or black hue. It is usually responsible for highly discoloured waters. *Leptothrix,* in the form of transparent tubular threads is more widely spread and has less serious effects. *Cladothrix* is similar to *Crenothrix* but is longer in cellular structure. *Gallionella* resembles spirally-wound threads like two pieces of wire twisted together. The filamentous spirophyllum resembles a slightly spiral band of non-cellular structure.

To ascertain whether or not iron bacteria are present in water, a sample is allowed to stand for 10 days in a bottle at room temperature. If iron bacteria are present a white or brown deposit will appear. Before examination under a microscope, specimens are first treated with hydrochloric acid to remove residual iron. The cellular membranes are then stained with iodine. For the more delicate structures of *Gallionella* and *Spirophyllum,* staining with carbol fuchsin is to be preferred to the acid and iodine method.

Algæ-Bacteria Cycle

In waters containing algæic growths and iron bacteria a cycle is set up. The presence of algæ encourages growth of bacteria. Dissolved oxygen in the water oxidises the organic matter and carbon dioxide is formed as a waste product. The carbon dioxide dissolves in water to form a weak carbonic acid solution with consequent solution of iron which in turn is made available for oxidation by the iron bacteria. Corroded water mains must not be overlooked as a possible source of iron-contaminated water supply. It is well known that cast-iron pipes laid in clay soils which inhibit aeration, are subject to corrosion as the result of the activities of sulphate-reducing bacteria. Cast-iron may contain as much as 4.5 per cent of carbon and up to 2 per cent of silicon, the more inferior products being known as grey cast-iron. The carbon content is seldom less than 2.5 per cent and in grey cast-iron the greater part of the carbon is present in the form of graphite. The graphite performs the function of binding the iron particles together and as the latter are corroded or eaten away the material becomes more and more graphitic in character. The phenomenon is known as "graphitic wastage" or "graphitisation." Pipe-lines so affected are soft and light, and easily penetrated with a knife blade. It is thought that the main factor is the formation of hydrogen sulphide from the action of the bacteria, producing iron sulphide in contact with iron liberated by corrosion processes. Black soil and a bad smell in the vicinity of such corroded pipes indicate the presence of sulphuretted hydrogen H_2S and iron sulphide FeS.

It is possible in some instances for iron contamination to occur from such a source, and in some instances a water supply which has no iron from its source may be contaminated by contact with this type of corrosion area in the supply lines.

Removal of Iron from Water

The amount of iron impurity in any water is usually small, but as already emphasised the effects of its presence are often very harmful. Aeration, coagulation and filtration provide the best remedies. Iron tends to settle out of its own accord by natural atmospheric aeration and oxidation in the course of flow. Any iron which happens to pass into the ordinary supply, however, has an effect similar to lime and magnesia salts in the production of scale in supply lines—boiler shells, etc., and in the formation of insoluble soaps in industrial scouring processes. Where surface supplies are iron-contaminated settling may precede coagulation with sulphate of alumina and subsequent filtration.

As previously pointed out, in deep-well waters with a high carbon dioxide content iron will be present in the form of ferrous bicarbonate. Waters of this class may be quite clear when drawn, but after being allowed to stand in the air for some time a yellowish or brownish precipitate will form. There are three methods by which it may be removed, *viz.*: (a) the ferrous bi-carbonate may be oxidised by aeration to form ferrous hydroxide, which then settles and may be filtered as described above. (b) A manganese zeolite bed is used to oxidise the iron to ferric oxide which is then removed by the filtering action of the manganese zeolite bed. (c) Ordinary zeolite water-softening treatment.

In all treatments it must be borne in mind that conversion of the iron to the ferrous state renders it comparatively harmless. Its removal, however, is made possible by converting the ferrous salts to ferric salts by aeration and atmospheric oxidation. Ferrous salts are stable and soluble whereas ferric oxides are unstable and insoluble in water.

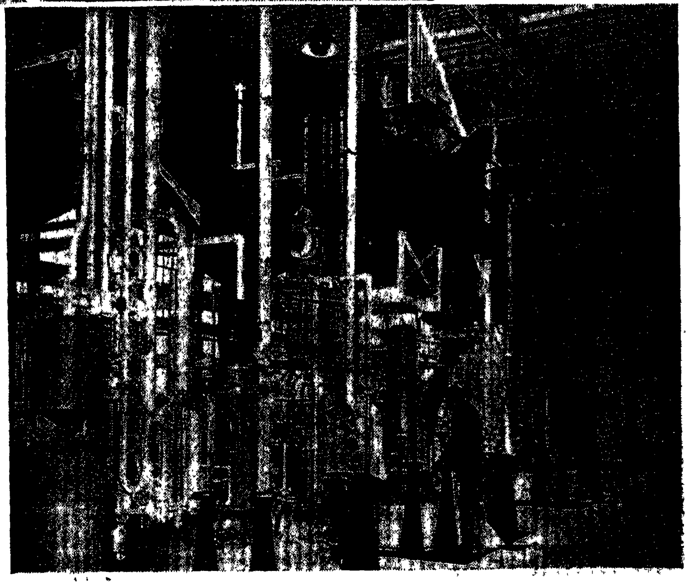
Actinic ultra-violet rays of sunlight, which accelerate the oxidation of iron from the ferrous to the ferric state, also help to remove iron from water.

(To be concluded)

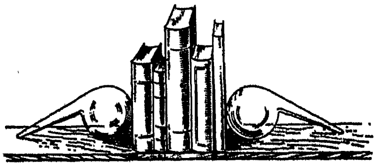
NEW ALKYD RESIN PLANT

THE (U.S.) General Electric Company's newly constructed plant at Anaheim, California, has begun operations for the manufacture of the company's Glyptal alkyd resins, basic ingredients for paints, enamels, and other surfaces. Company officials said that the new plant, a unit of the General Electric Chemical Department, has been established to supply users of alkyd resins on the west coast of the United States and also to supply the Orient and Far East. Production of the resins has heretofore been confined to the company's Schenectady, New York, plant.

Photograph of the alkyd resin plant showing storage tanks in foreground



Control floor for process kettles



A CHEMIST'S BOOKSHELF

Molecules Against Microbes. E. S. Duthie. London: Sigma Books, Ltd. 1947. Pp. 154 + X. 6s.

To many, and especially to those who are not chemists, chemotherapy has come to represent the manifestation which typifies this great general advance in chemical achievement. There are plenty of excuses for such a lop-sided view of the general activity which in the field of mineral oils alone, has produced results which in any other age would stand as miracles; and the claims to recognition of those other branches of chemistry seem likely to go unheard. The extremely colourful story of the harnessing of chemistry to perform modern miracles of healing however, has itself only partially been told, and a good reception is assured for such contributions as Dr. Duthie's, sufficiently technical to appeal to the doctor or chemist, who will skip the shorter explanatory passages which render the survey intelligible to the layman. It provides a short account of the various agents which cause disease and brief description of the chemistry of organic compounds which have been enlisted to deal so spectacularly with bacterial infection, such as the sulphonamide series and penicillin. Medical usage in war has brought to the latter the widest recognition and Dr. Duthie gives a comparatively full account of its industrial production and purification, how it destroys the bacterial cell, and of some fairly recent work on similar compounds derived from moulds.

Fundamentals of Plastics. H. M. Richardson and H. Watson Wilson. McGraw & Hill Book Co., New York. London, 1946. 25s.

From the number of books that are appearing from American sources on the plastics industry it would appear that the Americans have more paper for plastics literature than we have for newspapers. Some are good, some are bad and the remainder indifferent. This one is undoubtedly one of the excellent volumes and worth while studying. Many well-known American plastics technologists have contributed articles to this volume, which are well written. There is comparatively little overlap between one chapter and another in spite of the large number of chapters.

The plastics industry has been dealt with from practically all aspects, manufacture, testing, moulding and quality control are just some of the topics concerned.

This book will be extremely useful to those who are taking examinations in plastics technology either for the Institute of Plastics industry qualifications or for the City and Guilds Certificates as well as those who are already well established in the plastics field.

Fundamental details are given in the volume of the relationship of chemical structure to physical properties and a chapter is devoted to each of the six main classes of plastics.

Design is extremely well dealt with by Mr. J. H. Du Bois and the question of inserts is given suitable attention.

One failing I have to find with this volume is that while the index is extensive, it is not sufficient to find details on any particular topic. For instance there are six references to polyvinyl chloride so that for any particular aspect you have to look through six sections of the book.

Casting of the various types of films and the question of latex is not adequately discussed especially when we know that the Americans are further advanced in this field than we are. This applies in particular to PVC latex.

It is rather striking that a large number of volumes are now devoting sections to rubber, but in a book on plastics it is impossible to give adequate attention to a subject which requires a volume of its own, even to the student of plastics. This statement is partially negatived by the fact that an excellent list of literature is given at the end of the chapter so that if a plastics technician should be interested in the rubber field he will be able to satisfy his thirst for knowledge.

A Bill extending the term of Public Law No. 690 ("Boykin Act") for the belated claiming of priority under international convention for patent applications filed on or after September 8, 1938, in countries affording reciprocity with the U.S.A., has passed both the House of Representatives and the Senate, and is expected to become law by August 8, 1947, when the existing Act is due to expire. The new date is February 29, 1948.

Great Britain has afforded reciprocity with the original Boykin Act by Patent Rules No. 484 of March 17, 1947, and will undoubtedly issue an extension corresponding with that in the U.S.A.

GLASS IN THE LABORATORY—IV

Burners for the Glassblower

by I. C. P. SMITH, B.Sc., F.R.I.C.

THE glassblower's burner must have certain very definite characteristics, notably an especially high flame velocity, which appropriate design alone can provide. Such burners are of two general types, the centre air jet type, most frequently met with on the bench, and the pre-mixing type, better adapted to mechanical or repetition production. Fig. 1a is of a typical burner in the former category constructed for commercial use, while the burner is shown diagrammatically in Fig 1b.

The essential requirements of this type are that the air and gas taps, A and B respectively, should be of a full-bore pattern without the constrictions usually found in small pet-cocks; ¼ in. bore is the minimum suitable for a laboratory blow pipe, but ⅜ in. is better for production purposes. For taking rubber tubing the corrugated finish shown, or alternatively a plain tube with rings turned on it, as in Fig. 3, is usually better than the "Acorn" finish. Lever handles are generally preferred and the gas tap should be set well back out of the way of the work.

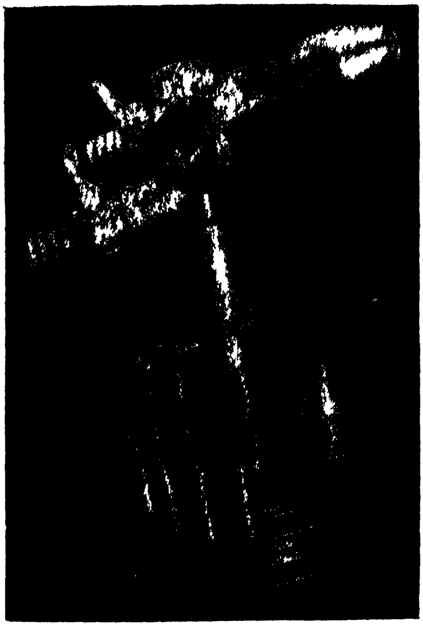


Fig. 1a.

The air tap is connected directly to the air tube C, which is provided with a range of screwed-in jets H; it is a sliding fit in its guide tube D which is centred in the body of the burner E by means of a drilled plate G.

Flexibility

The burner is completed by a sliding sleeve F, to which are fitted two sizes of nose piece J. Flexibility is generally the key note of this type of blow pipe, so that the small nose piece is employed with the smallest flames and a larger one for medium flames, while for the largest flames the nose piece is removed, leaving only the sleeve F. The nose should have sufficient metal to stand an occasional knock and to carry away some heat, but be sufficiently thin and well shaped to give a streamline flow to the secondary air.

The air jet should be selected according to the size of flame required and should work without turbulent flow. Generally the jet should have a length three to four times its bore for best operation. The spare air jets H are conveniently screwed to the base of the blow pipe and should be carefully looked after. Some workers still use short lengths of glass tubing for the jets or a piece of "Bornkessel" multibore glass or silica tubing, but the properly constructed metal jets are generally best.

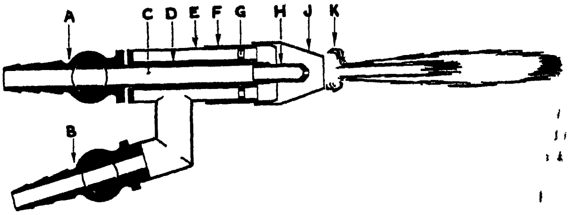


Fig. 1b.

The careful centring of the air jet is essential for a well-shaped flame. Three points must always be borne in mind: (1) The jet may be changed rapidly, preferably without turning out the gas; (2) the jet may be located longitudinally in relation to the burner opening; (3) good centring must be maintained. In some blow pipes the point (1) is covered only by the sliding air tube F, this being removed for changing jets.

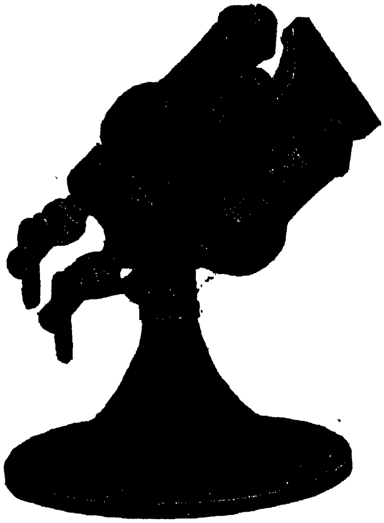


Fig. 2.

Safeguards in Use

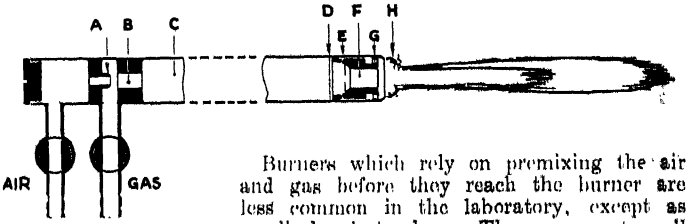
When the blow pipe is in use, the air jet should be adjusted longitudinally in relation to the opening, so that there is a small "flag" of yellow flame (K in Fig. 1b) not picked up on the jet; this corresponds to the base flame referred to in the premixing burners described later. If the air jet is brought further back, so that this yellow flame disappears, there is a tendency for the body of the burner to become over-heated; also, with maximum air opening, the air may blow out the flame. (It follows from this that these burners have no injector action on the gas main.) In other words, the air velocity from the jet may be greater than the rate of flame propagation for the air-gas mixture; and it is this base flame which keeps the blow lamp flame alight.

It is necessary to stress this aspect of blow lamps which alone ensures the maintenance of the high velocity flame essential for glass working. A low velocity flame, such as that from a Bunsen, Teclu or Meker burner, may have a flame temperature as high, *i.e.*, 1700 to 1800° C., but does not possess the high rate of impingement necessary to penetrate the blanket of cooler gases surrounding the glass. The high velocity in the case of these blow lamps comes directly from the air jet; thus for optimum efficiency the jet should be suited to the size of the flame required. The flexibility of the burners, however, is such that any one jet has considerable range of usefulness simply by adjusting the air jet. Taken all in all, the centre air jet type of burner is a highly adaptable article and it is because of this that it makes its greatest appeal.

A burner having a turret head provided with three sizes of blow pipes to obviate the changing the jet or the nose piece is illustrated in Fig. 2. A quick turn of the head only is necessary to bring any one of the three sizes into play. The fourth position produces a flat flame useful for making bends.

Two of the more elaborate air blast burners have been described, but that is not to say that elaboration is always necessary. Plenty of good work is done with a piece of gas barrel with a drawn-down glass tube as the air jet, but the main principles should always be borne in mind.

Fig. 3.



Burners which rely on premixing the air and gas before they reach the burner are less common in the laboratory, except as small hand torches. They are not well adapted to varying size of flame; but they are, however, very efficient and comparatively quiet compared to the air-blast type, particularly when oxygen is employed. It may be that, with a little adaptation, they could be used more freely on the bench.

Premixing

Fig. 3 shows a diagrammatic section of a premixing burner. The air under pressure passes through the jet A, drawing gas by injector action through the throat B into the mixing chamber C. This chamber is frequently doubled back on itself to give ample mixing space. One mixing chamber may feed one or more of the burner jets, and long pipe lines may be interposed, but these details are omitted.

The burner jet consists of two main parts, the main jet F and ring of base jets G, the latter being fed by the tiny holes drilled in the skirt E. In these burners the base flame H is particularly important owing to the high gas velocity at the jet, thus it is necessary to check occasionally that the holes E are clear. The jet piece is normally a push fit in its outer tube. Before the jet is a fine metal gauge filter D; this is a filter only, and not a flame-trap; if the flame is allowed to strike back on to it, it will very rapidly burn through.

Premixing Burners

In premixing burners the air-jet, the throat and the burner jets are carefully proportioned together, and the range of a particular burner is limited, since if the air and gas are turned down too low, the mixture velocity at the jet falls off, giving a flame unsuitable for glass-working. Throttling down to 50 per cent of the maximum for a particular assembly is about the lowest limit for effective use. A full range of burner sizes is, however, available, being selected according to the job. These burners may on occasion be used for producing a controlled stream of hot air, as for localised annealing, etc., by turning down the gas only, the flame then appearing as a blue haze surrounding the emergent stream.

The oxy-coal-gas burners, Figs. 4, 5 and 6 are primarily designed for lead-burning and brazing, but they may be employed for working the hard glasses. They are very effective, have a flame temperature of 2000° to 2200°C., and are comparatively quiet. In order to obtain different sizes of flame, a range of jets is available for each burner; they are thus particularly useful for reptition work, such as bench moulding. A convenient arrangement for varying work is to clamp the small burner (Fig. 4) over one of the larger burners, to have two sizes of flame immediately available.

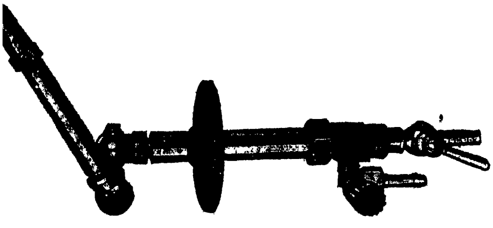


Fig. 5.

In the burners designed for oxygen-coal-gas the base flame is unnecessary, owing to the very high rate of flame propagation of this mixture, so that the burner jet is simply brought down to a suitable aperture to give the necessary gas velocity.

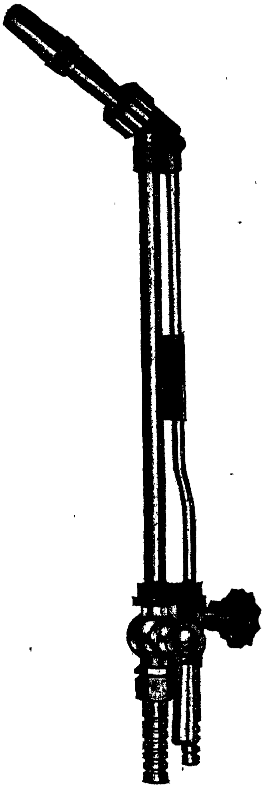


Fig. 6.

The burner, Fig. 3, is designed particularly for air-coal-gas, and those in Figs. 4 5 and 6 for oxygen-coal-gas and it must be stressed that any mixtures of air and oxygen are difficult to cater for. The reason is that, considering first the air-gas burner and assuming a given gas consumption, for every volume of oxygen added to the air, four volumes of nitrogen must be omitted. This greatly affects the mixture velocity at the burner jet, with danger of striking back. In the oxy-gas burner, on the other hand, one volume of oxygen induces a like volume of gas, and a high oxygen pressure is necessary to ensure a sufficiently high mixture pressure at the jet. The burner, Fig. 3 will, however, take a little added oxygen, and the larger burners Figs. 5 and 6 a little added air, but efficiency rapidly falls off. Whereas it is an easy matter, though often very noisy, to employ varying oxygen-air mixtures in the centre-jet type of blow-pipes (Fig. 1a) simply by running the oxygen into

German Fertiliser Processes

ACCORDING to *The American Fertiliser* two new methods of making synthetic fertilisers are described in a report on German nitrogen products (*Fertilisers made by I.G. Farbenindustrie A.G. at Leuna and Piesteritz*: PB-44650; photostat, $4; microfilm, $2; 57 pages, including flow sheets and tables) now on sale by the Office of Technical Services, U.S. Department of Commerce. The report, prepared by Robert B. MacMullin for OTS' technical industrial intelligence division, describes fertiliser manufacture at the I. G. Farbenindustrie plants at Leuna and Piesteritz in the Russian occupation zone.

Leuna officials told the investigator that they had recently developed a process for making two of their standard fertilisers, Stickstoff-Kalk-Phosphat and Nitrophoska, without the use of phosphoric acid. Both products have been made at Piesteritz and Leuna for many years by adding phosphoric acid to the ground phosphate rock in order to raise the phosphate-calcium ratio to the point required for fertiliser. In the new process, raw phosphate rock is treated with nitric acid and the excess calcium is precipitated as calcium nitrate tetrahydrate, which can also be used as a fertiliser. After the phosphate material has been neutralised with ammonia gas it is granulated, either with slag to make Stickstoff-Kalk-Phosphat or with potassium salts to make Nitrophoska, and finally dried.

The process was never put into commercial production at Leuna because operations were curtailed by wartime shortage of phosphate rock. Leuna officials claim, however, that the new process has distinct advantages over the old.

Recent Developments

Another fertiliser called Leuna Nitrophoska, somewhat different from the Nitrophoska obtained by the process described above, was recently developed at Leuna. Like the regular Nitrophoska, it contains 12 per cent nitrogen, 12 per cent phosphorus pentoxide and 21.5 per cent potash. However, the phosphate is in a non-water soluble form, making it unusable for some purposes but perfectly suitable for certain other types of crops and applications. According to the German experts, Leuna Nitrophoska may be produced more economically than regular Nitrophoska. By decomposing the phosphate rock in stages, considerably less nitric acid is needed in manufacture.

For many years the I. G. Farben plants at Leuna and Piesteritz have been important sources of artificial fertilisers in Germany. Recently these plants have tended toward the production of complete fertilisers with "soil improving" qualities. None of the Leuna and Piesteritz products are radically new types, but some improvements in manufacturing methods should interest American companies, the investigator concludes.

In addition to the Nitrophoska fertilisers and Stickstoff-Kalk-Phosphat, the report describes manufacture of the following products: ammonium sulphate; ammonium nitrate (for use as an explosive or as an ingredient in mixed fertilisers); Leuna Salpeter, a granular fertiliser containing 26 per cent nitrogen; and Kalk-Ammon-Salpeter, a granular calcium-nitrogen fertiliser.

(*Continued from page* 167)

a T-piece before the air tap, in the premixing burners it is difficult unless a predetermined mixture is adhered to. Gas under pressure simplifies design of burners, as the injector is unnecessary, and is employed in some works for this reason.

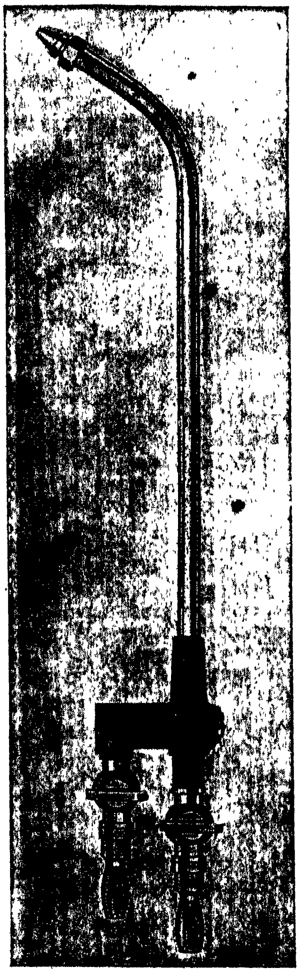


Fig. 4.

RADIO OVENS FOR CHEMICAL INDUSTRY

RADIO heating is amongst the most interesting of the various new processes now available to industry. It enables heat to be produced directly throughout a mass of material, thus avoiding the delay which normally occurs due to the relatively slow penetration of heat through the surface layers. There are a number of potential applications in the chemical and allied industries, such as the heating or drying of powders and tablets, and also such widely different processes as the dextrination of starch and heating of polyvinyl chloride chips.

A typical radio heating installation consists of a feeder which draws a supply of material continuously from a hopper, passes it between radio heating electrodes, and then, in a heated condition, on to the following processes. Such an equipment is an ideal way of moisture conditioning tablets or powders before packing. By this means it is possible to perform drying operations in a fraction of the time taken in a normal conveyor oven. In the case of substances where decomposition or loss of volatiles is a function of time as well as temperature, it may be advantageous to introduce a radio dryer directly into the production line.

The heating of polyvinyl chloride chips, gelatine and similar substances falls in a slightly different class. The need for rapid heating here arises due to the desire to avoid evaporation of the plasticiser, or liquid content. Continuous radio ovens can also be used with advantage for such purposes as the dextrination of starch. In this instance radio heating makes possible excellent control with a rapid and uniform rise of temperature, without any danger of scorching the surface layers.

Equipments capable of developing heat outputs of 10, 25, 45, 90, 225 and 350 B.Th.U. per minute within the material being heated are being manufactured. The largest of these equipments is for example capable of delivering a continuous supply of polyvinyl chloride chips heated to 100°C. at a rate of 1 ton per 8-hour shift.

Steelworkers' Dispute with Union.—Refusal by some 1000 members of the Iron and Steel Trades Confederation to operate an agreement between their union and the employers to operate certain heat and smelting departments over the week-ends is reported from Sheffield, where it was anticipated that the union would expel the recalcitrant members. Failure to comply with the agreement which would not affect the 48-hour working week, may result in a weekly loss of 2000 tons of steel.

CHEMICALS IN FELT INDUSTRY

Problems for New Research Association

THE latest body to form its own research association, in conformity with the general tendency of other British industries is the British Hat and Allied Feltmakers' Association. Under the direction of Dr. T. Barr (*see* "Personal" column, p. 172) the Association will be quartered in the textile industries department of the University of Leeds.

One of the urgent problems already on the Association's programme, is to discover a method of carroting, without the use of mercury. Carroting, the name given to the 200-year-old process for improving the felting properties of wool and other animal fibres, consists of brushing the fur (before removal from the pelt) with a dilute solution of nitric acid and mercuric nitrate. Not only does this process leave an undesirable reddish-yellow colour at the tips of the hair, but it has an adverse effect upon the health of operatives.

Another item on the agenda is the necessity for finding an inexpensive yet effective substitute for shellac, the secretion from the lac insect which provides the felt with its characteristic resilience. No doubt attempts will be made to modify the existing shellac process—with possible beneficial results.

Fumigation with Methyl Bromide

Precautionary Measures

The Home Office has published an 8-page pamphlet stressing the dangers attending the use of methyl bromide as a fumigant, and recommending that "it should only be employed by responsible and technically competent persons, who should have a working knowledge of the nature of the gas and of the precautions in its use."

It is emphasised that although the gas is highly toxic, it gives off but a faint odour, and many people cannot detect it even when harmful concentrations are present. Boiling below normal atmospheric temperature it is distributed as a liquid in cylinders. Direct skin contact leads to severe blistering and other ill effects; clothing contamination too is to be avoided at all costs. Fumigation operators have lost their lives both as a result of exposure to high concentrations and continued exposure to low concentrations.

There is at present no simple chemical means of detecting low concentrations, the normal practice being to employ the halide detector lamp. Copies of the pamphlet may be obtained from H.M.S.O., price 2d.

U.S. Coal Prospects.—Britain will receive about 396,000 tons of American coal this month, according to a spokesman of the U.S. Coal Export Committee.

Parliamentary Topics

Bulk Buying Attacked.—The policy of bulk buying had caused big increases in the world price of copper and zinc, said Mr. O. Lyttelton in the course of the debate on the Ministry of Supply estimates. Copper, he pointed out, had risen from £62 a ton in 1946 to £132, having been £137 a ton in March of this year. The price to American users, however, operating in the open market, was £119 10s. a ton. Zinc now cost £70 a ton compared with £58 7s. 6d. a ton in the United States, which did not indulge in bulk purchasing. The machinery of allocation of sheet steel creaked and groaned under the Government's over-centralised direction. The Minister (Mr. J. Wilmot) said that instead of the embarrassing surplus of non-ferrous metals which experts had expected after the war, they had run into the severest shortage known in modern times. There would be no purpose at all in reverting to private trading in these metals and reopening the London Metal Exchange as long as dealings were not possible owing to the stringency of supplies and currency restrictions.

Staggered Hours Compulsory.—The Minister of Labour (Mr. G. Isaacs) announced that it had been decided to take compulsory powers under a Defence Regulation to oblige industries to spread their use of electric power over non-peak periods of demand by staggered working hours as from October 1. Maximum penalties of £500 and a year's imprisonment might be imposed on those who disregarded the order. Workers could not be penalised, except by loss of working time, if they refused to co-operate.

Fluorine Committee Report.—Mr. Charles Williams asked the Lord President of the Council when the report of the Fluorine Commission which visited Port William aluminium works in 1945 is to be published. Mr. H. Morrison: The report of the committee set up by the Medical Research Council at the request of the Department of Health for Scotland, is ready for press, and is expected to be published during the autumn.

Coal Board Deficit?—Major P. G. Roberts: Does the Minister of Fuel deny the reliable reports which are going about that, in the first six months, a loss has been made on the operation of the National Coal Board, and, further, will he use his influence with the Minister of Supply to see that no further nationalisation of steel takes place until these figures have been given?. Mr. Shinwell: The only reliable reports on the subject are those made by myself to this House.

Official Notices

Pig Iron and Scrap Licences

The Iron and Steel Board wishes it to be known that in view of the need for making the most efficient use of available supplies for the production of iron castings, the Board closely examines applications for licences for the purchase of pig iron and scrap, and may be compelled to withhold such licences in the case of iron foundries not already in operation unless the Board's prior approval of the undertaking has been obtained. Individuals or companies contemplating entering the iron foundry business are therefore advised to communicate with the secretary of the Iron and Steel Board, Bush House, South West Wing, Strand, W.C.2.

Quinine Controlled

Quinine and its salts, and other products of cinchona bark, are now in very satisfactory supply, and so there is no longer any need to continue control over their supply in this country. An order, S. R. and O. No. 1553 of 1947, Control of Cinchona and Cinchona Products and Synthetic Substitutes (No. 3) Revocation Order, 1947, revoking this control from July 20, 1947, has accordingly been made.

For the time being, export control will be retained on quinine, quinidine, cinchona and other salts. This is to ensure that the relatively small quantities of these drugs, needed for essential purposes, are available in the unlikely event of a future shortage.

Cement Prices

The Ministry of Works has announced an increase of 1s. per ton in the maximum selling price of ordinary Portland and rapid-hardening cement. Different prices prevail throughout the country, but 58s. per ton may be regarded as a representative figure for prices hitherto applying for deliveries in the London area.

Chemical Production in 1946

Better Outlook

In the course of his address circulated with the report and accounts for 1946, Mr. Alfred J. Thompson, R. W. Grieff & Co. chairman, states that his company's production of heavy chemicals and solvents, pigments and accessories of the paint industry showed an increase over the year, and that the 1947 output judging by results already achieved, would be even better still Much depends on both the fuel and dollar situation, however, Mr. Thompson adds, " the effects of which may be beyond the power of the ordinary commercial community to overcome."

POLISH BUNA RUBBER PLANT

THE Polish Ministry of Industry has taken over a German-constructed plant at Dwory, near Oswiecim (Auschwitz) built for the production of Buna synthetic rubber. Between 1941 and 1943 it was continually enlarged and at the liberation of Poland some 43,000 persons were employed. Former German reports indicate that the plant was considered capable of manufacturing sufficient Buna rubber for world requirements after the German victory.

Under the terms of the Polish-Russian Reparations Agreement, Poland has obtained the equipment of a German synthetic petroleum factory situated near Berlin together with the plant of a generating station giving 10,000 kW. This material is at present being assembled and erected at Dwory for the future production of synthetic petrol, fuel oils, paraffins, etc. With the concurrent installation of equipment for methyls, carbides and a coking plant, all designed for the output of artificial rubber, plastics, fats and other materials, Poland is seeking to make herself independent of imported supplies in the future.

Polish technicians are undergoing specialised training in Germany for the operation of the plant when completed and at present some 2000 workers are employed at the site. Czechoslovakia is also interested in the development of the scheme and has proposed the installation of a 12,000 kW generating station at the works, half the produced energy to be available for production and the other half for export to Czechoslovakia.

INDIAN SHELLAC

Competition from Substitutes

The Indian shellac industry, which exports products to the value of Rs.2 crores to Rs.10 crores, and employs at least 30,000 workers to purify the crude lac, as well as many lakhs families in the villages to collect the lac from the trees, is confronted with a serious problem. The U.S.A., which until recently obtained from India one-half to two-thirds of her exportable lac for gramophone record manufacture, now uses recently-discovered synthetic resins. Although the synthetics are a little costlier to produce, the finished records are not only unbreakable, but there is an absence of surface noise.

With a view to overcoming present difficulties, the industry is understood to be considering the possibility of reducing the price of shellac. In addition, an attempt will be made by means of research to produce unbreakable, noiseless records from shellac.

JAPAN'S CHEMICAL INDUSTRY

ACCORDING to the March report on Non-Military Activities in Japan, issued by S.C.A.P. (No. 18), a copy of which has just been received, continued fuel and power shortage resulted in a sharp drop in chemical production during February. Output of basic heavy chemicals aggregated about 23 per cent of the estimated minimum requirements of Japan's national economy. 75,771 tons of sulphuric acid were produced, while ammonium phosphate output amounted to 44,754 metric tons, *i.e.*, 73 per cent of the planned output. Lower calcium carbide production led to a decline in that of calcium, and carbide stocks were heavily drawn upon. Caustic soda was down by 12 per cent, while benzene output dropped 20 per cent to 354 metric tons. Production of dyestuff and drug intermediates increased, nitrotoluene and aniline showing the greatest advances. Total dyestuff output increased approximately by 16 per cent in February with 100 per cent increases in direct and acid dyes. Chrome dyes required in the manufacture of woollen goods were being produced in increasing quantities.

BERLIN'S PRECISION TOOL INDUSTRY

That Berlin's precision-tool manufacturers are active again in the field of surgical instruments and cinematographic and scientific apparatus is apparent from a recent meeting of precision-tool and optical instrument makers in that city.

At present there are about 350 firms dealing with precision-tools and optical instruments in Berlin. Among them are firms with a world-wide reputation, such as Askania, Zeiss-Ikon, Injekta, Fuess, Schmidt-Haensch, Windler, and also divisions of Siemens, Lorenz, Telefunken, AEG. One hundred and sixty-four of these works are in the U.S. sector, 67 in the British, 80 in the Russian, and 30 in the French sector.

AUSTRIA'S 1946 PRODUCTION

Austria's industrial and mining production figures for 1946 (given in metric tons) were as follows: Hard coal, 104,956; brown coal, 2,402,125; metallurgical coke (Linz), 106,884; zinc concentrates, 1505; lead concentrates, 1450; soft lead, 4474; raw magnesite, 89,346; caustic magnesite, 22,208; iron ore, 460,100; pig iron, 56,430; pig iron (foundry), 1437; crude steel, 187,004; steel (rolled, 122,171; forgings, 4122; aluminium (ingots), 1035.

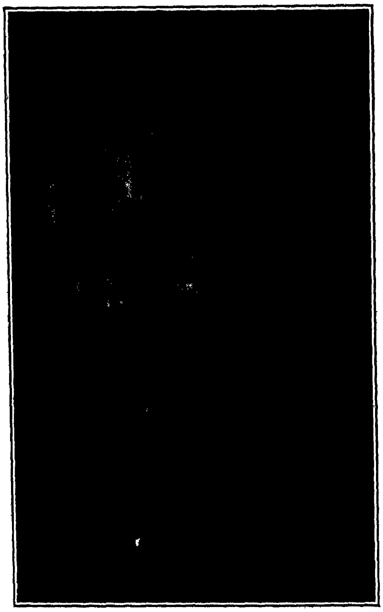
Personal

Mr. J. W. Napier has been appointed a director of Fisons, Ltd.

Mr. D. McL. Turnbull and Mr. James Barr have been appointed joint managers of Turnbulls, Ltd., in succession to Mr. Harry Cunliffe.

Mr. and Mrs. Harry Cunliffe were honoured by the entire works staff of Turnbulls, Ltd., Hawick, prior to Mr. Cunliffe's transference to Manchester where he is now an executive director of the British Cotton and Wool Dyers' Association, Ltd. This move ends an association of some 30 years during which Mr. Cunliffe has guided the activities of Turnbulls, Ltd., and during which period its activities have been greatly expanded.

Dr. Thomas Barr, who yesterday commenced his duties as director of research of the newly-formed British Hat and Allied Feltmakers Research Association, was formerly in charge of a research section in the I.C.I. dyestuffs division where he was carrying out fundamental research work on textile processes. Dr. Barr is 36, was born at Hamilton, Lanarkshire, and is an amateur boxer and rugby footballer.



Lord Melchett

Lord Melchett, deputy chairman of I.C.I., has resigned from the board for reasons of ill-health.

Mr. Norman French, managing director of Benn Brothers, Ltd. (proprietors of The Chemical Age), is accompanying a U.K. delegation of businessmen who are leaving next week on a visit to British Columbia by invitation of the B.C. Provincial Government.

Sir Robert Robinson, P.R.S., has been awarded the Albert Medal of the Royal Society of Arts "for his outstanding contributions to the advancement of organic chemistry. The medal was presented by Sir Harry Lindsay, chairman of the Council of the Society, on Monday last.

Mr. H. Paterson, manager of the Newcastle-on-Tyne office of the Metropolitan-Vickers Electrical Co., Ltd., and Mr. C. Petersen, manager of the company's Manchester office, have recently relinquished their duties and have been succeeded respectively by Mr. A. J. Crawford and Mr. J. B. Hartley. Both Mr. Paterson and Mr. Petersen will remain available for consultation until the end of the year.

Mr. H. S. Gibson, general fields manager, Anglo-Iranian Oil Co., Ltd., Abadan, has been awarded the Redwood Medal of the Institute of Petroleum for his outstanding work in the production of petroleum. Established in 1921, in honour of Sir Boverton Redwood, the medal has been awarded only on seven previous occasions, the last being in 1938. Mr. Gibson received the C.B.E. in this year's King's Birthday honours.

Dr. E. R. H. Jones, reader and assistant professor of organic chemistry at the Imperial College of Science and Technology since 1945, has been appointed Sir Samuel Hall professor of chemistry and director of the chemical laboratories of Manchester University in succession to Prof. E. L. Hirst. First coming to the University in 1936 as a research assistant to Prof. Heilbron, Dr. Jones left in 1938 to become assistant lecturer in chemistry in the Imperial College of Science and Technology. He was promoted to a lectureship in 1941. Dr. Jones is the author of many papers published in scientific journals, and received the distinction of the Medola Medal of the Institute of Chemistry in 1940.

Obituaries

Mr. Louis Herbert Hartland-Swann, C.B.E., of Queens Court, W.2, late advisory director of Unilever, Ltd., died recently at the age of 69.

Prof. Alfred W. Stewart, who had suffered ill-health for some years, died recently in Belfast. He was the youngest son of the late Prof. William Stewart, Dean of Faculties in the University of Glasgow. Educated at that University, the University of Marburg and University College, London, he had held in turn the lectureship in organic chemistry at Belfast and the lectureship in physical chemistry and radioactivity at Glasgow. In 1919 he succeeded the late Prof. Letts as professor of chemistry at Belfast.

Home News Items

June Cement Production.—Cement production during June totalled 630,000 tons as compared with 565,000 tons in June 1946.

New Oil Refining Plant.—The first building is being erected at Carrington, Cheshire, of a big plant to develop a new oil refining process, for which Petrocarbon, Ltd., have purchased a 700 acre site on the estate of Lord Stamford. The project was strongly opposed by the local agricultural executive committee.

Lactic Casein Price Reduction.—From July 1, the selling prices of lactic casein which is distributed through the Lactic Casein Importers' Association, has been reduced by £15 a ton. Consignments of one ton and over are now priced at £225, £220, £220 and £230 for 90, 60 and 30 mesh, and soluble respectively. Quantities of less than a ton of the four varieties now sell at £230, £225, £225 and £235 respectively.

Carbon Black "Ad Lib."—Carbon black will be arriving "in unlimited quantities from the United States next month," states the Board of Trade, replying to the warning by the National Road Transport Federation that there is a grave risk of breakdown of British transport services because of the acute tyre shortage. Sir Harold Kenward, director of the Dunlop Rubber Co. and president of the Tyre Manufacturers' Conference, confirms that supplies of carbon black should be greatly improved by mid-August.

A New I.C.I. Factory.—Imperial Chemical Industries is proposing to start an industrial undertaking at the site of the former Ministry of Supply factory at Drungans, near Dumfries. This was stated by one of I.C.I.'s chief officials, Mr. E. Rigby, when he visited Dumfries waterworks this week. Negotiations with the Government regarding the proposed factory were expected to begin shortly, and it was hoped that difficulties such as shortages of steel, timber and other materials would be overcome.

Re-establishing Hull's Industries. — Bombing destroyed or damaged 12½ per cent of the industrial buildings of Hull and a considerable number of manufacturers had to move out. Now the corporation, in conjunction with the Kingston-upon-Hull Development Committee (whose 1946 report is just issued) has reached an agreement with the principal local industries—flour milling, oil-seed crushing, chemicals and paint—to implement a scheme of rehabilitation and extension at a cost of £3 million. Nineteen industrial firms have re-established themselves in Hull during the year.

Fiji Tariff Amendment.—The following weed killers are now subject to a free British preferential tariff (20 per cent general tariff): chlorate of sodium; calcium chlorate; Weedex; altacide; arsenic pentoxide; Agroxone phenoxyl; dinoc; denoc; Weedone; "and any such other as the Governor in Council may from time to time specify."

"No Overtime" Decision.—One thousand key workers in the glass, plastics and paper industries at St. Helens will be affected by a decision taken at a meeting last week of the St. Helens District of the Amalgamated Engineering Union to place an embargo on all overtime. It was alleged at the meeting that firms in the local group of manufacturers were not implementing the national agreement for a shorter working week. The increasing mechanisation of the glass industry was given as a further reason for the union's decision.

Death from Acid Burns. — Thomas Langford, aged 33, of 4 Pen-y-Coed, Llanfollen, was fatally injured at the Waltham Abbey, Essex, factory of Catalin, Ltd., when he was splashed by carbolic acid and extensively burned. He was in charge of a tanker discharging acid into a storage tank. Apparently thinking that all the acid had been discharged, he disconnected a pipe and a quantity of acid splashed over him. He was taken to hospital but was dead on arrival.

Ballito's Nylon Production.—In his speech at the eighteenth ordinary general meeting of the Ballito Hosiery Mills Ltd., Sir Cyril F. Entwistle, the chairman, said that the company had commenced production of fully-fashioned nylon hose early in 1946, first retail deliveries being made in the December in accordance with an agreement made with the National Hosiery Manufacturers' Federation. Deliveries were increasing from month to month, and only shortage of nylon yarn prevented a more rapid expansion.

Mustard Gas Fire.—A truck load of 60 mustard gas bombs caught fire on July 23 in a munition train between Fulbourne and Six Mile Bottom, Cambridge. The main line between Cambridge and Newmarket was impassable until decontamination had been carried out. Flames rose fifty feet into the air and gas fumes were spread over a sixty-yard radius. Five men were taken to hospital with slight mustard gas burns after dealing with the fire, which was allowed to burn itself out. The train was on its way from near Thetford, Norfolk, to Barry, Wales, where the bombs were to be dumped into the sea.

Overseas News Items

Italian Cyanamide Output. — Italy's cyanamide productive capacity is reported to total 200,000 metric tons.

Belgian Steel Production for July.—Belgian steel output which it was anticipated would show an increase during the summer months, did in fact rise from 227,000 tons of ingots in May to 229,000 in June. July returns are expected to be better still.

Twenty-first Exposition of Chemical Industries.—The Chemical Industries Exposition is to be held in the Grand Central Palace, New York City from December 1 to 6. Both chemical exhibits and equipment will be displayed on a larger scale than usual.

Lever Bros. Acquire Large U.S. Concern.—Harriet Hubbard Ayer Incorporation of New York, one of the pioneers of the U.S. cosmetics and perfumes industry, has been acquired by Lever Brothers Company of Cambridge, Mass. (a subsidiary of Lever Brothers and Unilever, N.V.). The terms of the transaction have not been made known.

Chile and Argentina Sign Nitrate Agreement.—An agreement recently concluded between Chile and Argentina provides for the shipment of sufficient quantities of Chilean nitrates to cover Argentina's total requirements, and to accumulate a stock of at least 15,000 metric tons. Argentina has consequently decided not to proceed with her plans for the erection of plants for the manufacture of synthetic fertilisers.

Development Committee for Japan's Chemical Industry.—To encourage and promote Japan's peace-time chemical industry, a Chemical Industrial Technique Committee was formed in March under the supervision of the Ministry of Commerce and Industry. The committee plans to reconstruct the chemical industry of the country and to modernise its production technique.

Leverkusen Plant Closes.—As the coal stocks of the Leverkusen Works at Frankfurt were sufficient only for a few hours this plant of the former Bayer concern has closed down. The output of mineral dyes, organic chemicals for the textile, leather and rubber industries, pharmaceutical and photographic materials and pest destroyers has been interrupted. Production of some heavy chemicals which do not require big quantities of coal has, however, not been interrupted. Among these are sulphuric acid, hydrochloric acid, chlorine gas and sodium nitrate. Efforts are being made to secure a regular supply of 15,000 tons of coal a month.

Electrical Installations in Buna and Leuna Works.—About 800 skilled fitters are employed at repairs and electrical fittings at the power plants of the Leuna Works, the Buna Works, the dye and film factory Wolffen, and at the power station of Leipzig Corporation. The "Leipziger Siemens Betriebe," being the sole electrical fitters to the entire industry at present employ 1170 workers.

Argentina Expands Output.—As part of its industrialisation plans, the Argentine Government aims at raising the annual production of caustic soda from 10,000 metric tons to 40,000; of barium chloride from 500 to 800 tons; of citric acid from 150 to 400 tons; of red lead from 650 to 1000 tons; of litharge from 500 to 800 tons; and of zinc oxide from 1400 to 3500 tons.

Bulgaria Signs Agreements with Austria and France.—Austria is to supply machinery, chemicals, iron and steel to Bulgaria under the terms of a new treaty. Bulgaria will furnish tobacco, sunflower kernels and grapes. France has arranged to supply Bulgaria with chemicals, pharmaceutical products, electric equipment, machinery and goods trucks. Bulgaria will make available wool, tobacco and lead.

Italian Rayon and Cellulose.—The Snia Viscosa, most important among Italy's rayon and cellulose concerns, produced 47,000 tons during 1946 (3600 in 1945), contributing 25 per cent of the proceeds of Italian exports. The "Snia" plant at Torviscosa is shortly to take up production of "alpha" cellulose wool for home consumption. An extraordinary meeting of shareholders has decided to raise the share capital, by using the reserves, from 1.05 milliards lire to 4.2 milliards lire. Accordingly, the shares' nominal value will be increased from 300 to 1200 lire (latest Italian quotation 2200 lire to the £).

Reconstructed Ruhrchemie Company.—Nearly 5000 workers are now employed in the works of the Ruhrchemie Company; only rarely has it employed as many workers in the past. The nitrogen plant is working with three eight-hour shifts daily, and as soon as permission is granted for the processing of coal-hydrogen the works will be able to extend its activities to produce synthetic petrol and other important products such as high-grade alcohol, paraffin, lubricating oil, fatty acids and cleaning detergents. Ruhrchemie was founded in 1927 with a capital of 27 million Marks (raised in 1942 to 40 million). In 1928 a four million dollar loan, and in the next year a three million dollar loan were taken up in New York.

Company News

Allied Leather Industries Ltd. is making a new issue of 150,000 prefence shares at £1 each, and 600,000 ordinary shares at 5s. each.

London Aluminium announces an interim dividend of 25 per cent on its ordinary shares for 1947. The previous year's interim was 10 per cent, the total for that year being 20 per cent.

Ragusa Asphalte Paving Co., Ltd., announces a net profit of £31,155 for 1946 compared with £17,802 for the previous year. A final payment of 12½ per cent making a total payment of 17½ per cent is recommended.

R. W. Grieff and Co. Ltd., chemical manufacturers, have announced a profit for the year just ended of £55,561 (compared with £37,765). A final dividend of 8¾ per cent and a bonus of 5 per cent on the ordinary capital (making with the interim dividend of 3¾ per cent already paid—17½ per cent) are recommended.

Fullers Earth Union reports a net profit for 1946 of £37,061 compared with £22,706 for 1945. Dividends of 5 per cent on the cumulative preference shares, 11 per cent on the non-cumulative preferred ordinary shares, and a final dividend of 11 per cent on the ordinary shares (making 15 per cent for the year) have been recommended.

For the year ended June 30, 1947 the directors of **Benn Brothers Ltd.** recommend a final dividend (less tax) of 3 per cent on preference shares, (the interim dividend of 3 per cent paid in February makes 6 per cent for the year); 20 per cent on ordinary shares, (the interim dividend of 5 per cent paid in February makes 25 per cent for the year, as compared with last year's total of 20 per cent); and 5s. per share on the deferred shares as against last year's 4s. payment.

New Companies Registered

Regis (Chemical Industries), Ltd. (438,524).—Private company. Capital £250 in 2000 founders' shares of 1s. and 150 ordinary shares of £1. Importers and exporters of and dealers in merchandise, etc. Subscribers: B. E. Nightingale and D. H. Roberts. First director: L. W. Loryman. Registered office: 38 King William Street, E.C.4.

James B. Fleming & Company (Liverpool), Ltd. (438,440).—Private company. Capital £100 in £1 shares. To acquire the business of a manufacturing chemist now carried on by James B. Fleming and Co. at 21 Hanover Street, Liverpool. Directors: J. B. Fleming and Dorothy Fleming. Registered office: 21 Hanover Street, Liverpool.

Humber Oil Company, Ltd. (437,643).—Private company. Capital £40,000 in 40,000 shares of £1 each. To acquire the business of an oil, colour and carbide manufacturer and dealer carried on by D. S. Barton at Burton Street, Hull, as the Humber Oil Co. Directors: S. Barton, Winifred M. Barton and G. D. Barton. Registered office: 71 Bricknell Avenue, Hull.

Robertson (Paints) & Co., Ltd. (437,670). Private company. Capital £500 in 500 shares of £1 each. Manufacturers of and dealers in all kinds of drysaltery, paints, oils, colours, spirits, drugs and chemicals, wall coverings, etc. Directors: Jemima M. S. Taylor, Elizabeth B. Robertson, and Mary A. M. Miller. Registered office: 706 Chester Road, Erdington, Birmingham.

J. Nott Gotobed & Co., Ltd. (435,759).—Private company. Capital £12,000 in £1 shares. Manufacturers, merchants or agents for lubricating oils, greases and other oils, paints, celluloses, chemical products, etc. Directors: J. N. Gotobed, Mrs. Violet G. Gotobed and Mrs. Beatrice A. Gotobed. Registered office: Regis Oil & Chemical Works, London Road, King's Lynn.

John Young (London), Ltd. (435,764).—Private company, Capital £10,000 in £1 shares. Manufacturers and refiners of, merchants in and agents for shellac, gums, glues, wax, varnishes, polishes, stains, paints, cellulose, etc. Directors: J. G. Young and N. Caws. Solicitors: Walker Charlesworth & Jefferson, 38-9 Parliament Street, S.W.1.

Tenz (London), Ltd. (438,465).—Private company. Capital £10,000 in 10,000 shares of £1 each. To acquire the business of Tenz, Ltd., and the registered trade mark B.536855, and to carry on the business of manufacturers of and dealers in chemicals, drugs, medicines, toilet goods and chemists' sundries, etc. Subscribers: E. Lowman and A. L. Burford. Registered office: Amberley House, Norfolk Street, W.C.2.

Sanoda, Ltd. (438,754). Private company. Capital £5000 in £1 shares. To acquire the business of a manufacturing chemist carried on by A. S. Baxter as "Sanoda Manufacturing Co." at 216 High Street, Pendleton, Manchester. Directors: Alfred S. Baxter (director of F.K.B., Ltd.) governing director and Mrs. Edna Baxter; Wm. C. Evans and Joseph Frankland. Registered office: 216 High Street, Pendleton, Salford, 6.

Erwin (Export & Import) Ltd. (438,785). Private company. Capital £500 in £1 shares. To carry on the business of manufacturing chemists, etc. Subscribers: Sylvia Rodish and Rosa Rosen. Directors are to be appointed by the subscribers. Registered office: 203 Regent Street, W.1.

Chemical and Allied Stocks and Shares

STOCK markets have been perturbed by the heavy fall in British Funds which commenced last week and persisted in the first part of this week bringing 2½ per cent Treasury bonds down to the new low level of 87, compared with par at which they were issued last year, while 2½ per cent Consols, also at 87, were at their lowest level since 1945. Originally attributed in the City to selling by industrial companies requiring money for extension and developments (Mr. Dalton's tax on bonus makes it difficult to raise additional capital on favourable terms) the fall in British Funds has assumed proportions which have aroused serious doubts whether Mr. Dalton's cheaper money policy can be maintained.

As a result of the higher yield basis now ruling for British Funds, other investments (particularly leading industrial ordinary or equity shares) have been adjusted to a lower yield basis, and falls ranging up to 5s. have been common on balance for the week. These falls have been out of proportion to the amount of selling, which generally was described as moderate, but the effect of selling was pronounced.

Reflecting the prevailing trends, shares of chemical and kindred shares have lost ground. Imperial Chemical, for instance were no better than 48s. 6d. at which the yield on the basis of last year's 10 per cent distribution is now 4⅛ per cent. Monsanto Chemicals were 59s., Fisons 61s. 6d., while B. Laporte were marked back to 97s. 6d. in accordance with the general trend; but in many instances it appeared doubtful if the lower prices were adequately tested by dealings. Glaxo Laboratories which some weeks ago were over £30 have fallen back to £21½, Dunlop Rubber were no higher than 73s. 6d., and Boots Drug were marked down sharply from 65s. 6d. to 62s. 9d., while Wall Paper Manufacturers deferred were 55s. 9d. Among shares connected with plastics, De La Rue fell to 55s., British Industrial Plastics were 9s. 7½d., Erinoid 17s. 6d., and following the maiden interim dividend, Catalin came back to 19s. 6d.

Declines in iron and steels have been generally moderate as shares were already generally on a higher yield basis that other industrial shares owing to nationalisation fears; and now sentiment is reflecting the view that nationalisation of the industry will have to be abandoned. Dorman Long eased to 26s. 6d., but Colvilles 26s. 3d., United Steel 26s., and South Durham Steel 28s. 6d. were little changed. Vickers at 28s. were helped by news of further expansion in the industrial interests of the group. Following their recent rise, British Glues & Chemicals have receded to 19s. 9d., British Aluminium fell back to 49s., Borax Consolidated were 59s. 6d., and British Oxygen fell to 99s. 4½d. In other directions, Aspro were down to 52s. 6d., Beechams deferred were 25s. 10½d., and Griffiths Hughes 50s. Turner & Newall were 3s. down at 84s. 4½d., United Molasses 54s. 3d., and despite the final dividend expected next month, the units of the Distillers Co. declined on balance by 7s. 6d. to 143s. Reflecting the prevailing trend, Associated Cement were also lower at 75s. 3d., and British Plaster Board 28s. 6d. Sangers have been relatively steady at 37s. 6d. Oil shares came in for considerable profit-taking, particularly Anglo-Iranian, which it will be recalled advanced substantially following publication of the financial results. Anglo-Iranian are now back to £10⅛, Burmah Oil 91s. 3d., and Shell £5⅛.

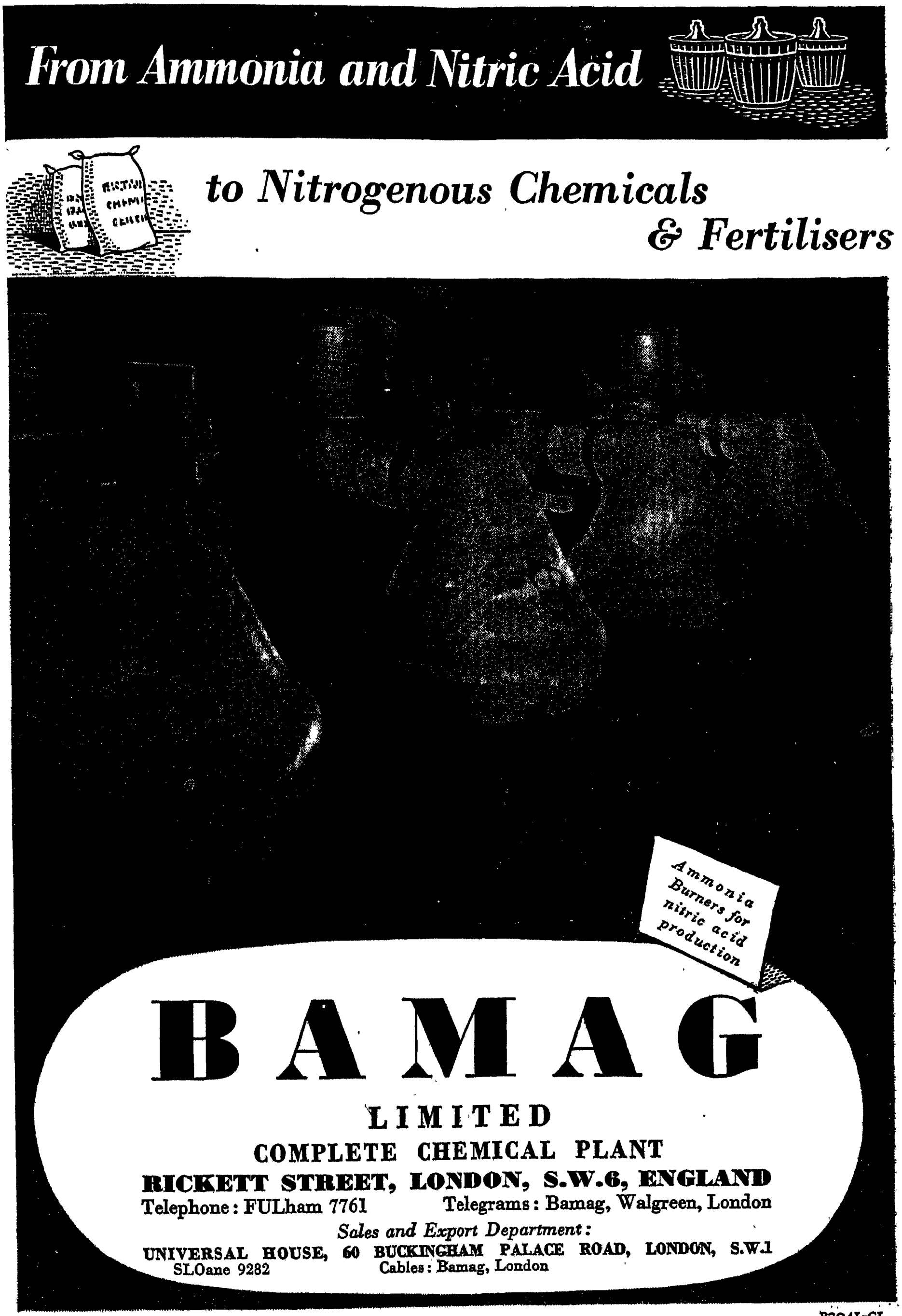
British Chemical Prices

Market Reports

ACTIVITY in most sections of the market is affected by the seasonal easing in demand and new business has been on a reduced scale. The general position, however, is little altered and offers usually find a ready outlet. Price adjustments have been surprisingly few and none of any importance have come to hand during the past week. Although the volume of overseas inquiries remains fairly substantial, actual bookings are becoming increasingly difficult to secure because of uncertain delivery dates. The movement in the coal-tar products market is almost entirely concerned with delivery specifications under existing commitments.

MANCHESTER.—Holiday conditions in the textile and other chemical-using industries in Lancashire are now pretty well at their height, but in spite of this a very brisk demand for the alkalis and other leading heavy chemical products has been reported on the Manchester market during the past week. There has been persistent pressure for deliveries of these against existing orders, and sellers report no lack of offers of fresh business both from domestic users and on export account. There has been no special feature of interest so far as fertiliser materials are concerned, business in most sections remaining at a seasonally low level. Supplies of most tar products are going forward steadily to the consuming end.

GLASGOW.—In the Scottish chemical trade business has been very quiet and on a reduced scale during the past week. This is a seasonal condition associated with the holidays. Inquiries from overseas have been on a fair scale and some orders have again been obtained.



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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Processing of rubbery vinyl ether polymers.—General Aniline & Film Corporation. Dec. 22, 1945. 32877/46.

Purification and polymerisation of vinyl sulphuric acids.—General Aniline & Film Corporation. Dec. 22, 1945. 34156/46.

Halogenated vinyl ether polymers.—General Aniline & Film Corporation.—Dec. 22, 1945. 34157/46.

Polymerising vinyl ethers. — General Aniline & Film Corporation. Dec. 22, 1945. 34160/46.

Dyestuffs of the anthraquinone acridone series.—General Aniline & Film Corporation. Dec. 22, 1945. 34939/46.

Anti-static photographic film.—General Aniline & Film Corporation. Dec. 22, 1945. 35675/46.

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The Chemical Age

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Telephone CENTRAL 3212 (12 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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A National Stocktaking

THE late Lord Bennett, ex-Prime Minister of Canada, said in one of his last public utterances: "Every generation has great problems to solve, and this country has led the way in solving most of the great problems that the world has had to meet. It is not too much to say that you are still doing so. You may lack something of the vigour and greatness of the past, because the world has become more settled than it was even twenty-five years ago; man has made progress, and the difficulties of solving the problems that now arise are greater than they used to be; but you are showing a capacity to deal with them, and that is all that can be asked."

These words, from a great Empire statesman who had come to spend his retirement among us, are heartening. In a large measure they are deserved. We certainly have not evaded the great problems of the world to-day. Political problems are being dealt with in a new way. There are conflicting views as to whether it is a wise way, but in foreign policy at least we are leading in a direction in which it is clear that the world will go within the next few decades. The department in which we have rather less ground for confidence is that of the solution of our own economic problems. This doubt is increased by a series of papers on economic reconstruction promoted by the Royal Society of Arts last session.

Conditions, as Lord Bennett said, have changed profoundly, and the world is far more complex than it was when Britain's industrial and economic fortunes were founded. One outstanding change is in the mechanical energy available to producers. Less manual work is required to-day than ever before, but quite as much, perhaps far more, energy is required to cope with modern requirements. Britain is an under-nourished nation. Many attempts have been made to disprove this, but the disclaimers do not accord with the general experience. Those fortunate enough to travel abroad return with tales of lands flowing with milk and honey; but, we are told, "the flowers are not for you to pick."

From the Society of Arts discussion it stands out clearly that this under-nourished country is finding it difficult after the strain of two of the most devastating wars in history to raise the energy to recover its fortunes. Many of the present industrial and labour difficulties arise from the fact that we are out of condition. Our people are listless, and demand more leisure than their work entitles. The five-day week for the mines was widely acclaimed, but its effect has been a reduction of output at a time when increased output was essential, and so the whole system has again to be reviewed.

The depreciation of money values is another change to which we have yet to become accustomed. One hundred years ago, Sir Robert Peel declared: "I have good reason for thinking that one of my police constables, if a single man, can find out of his pay of a guinea a week: (1) lodgings, (2) medical attendance, (3) very comfortable subsistence at his mess, (4) clothing, and can, after finding these, save out of his pay ten shillings a week." To-day, a man who earns £10 a week can get only about the equivalent of a £3 pre-war wage with it. The low purchasing

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power of money is at the root of quite a lot of our troubles to-day. As a consequence wages are chasing prices on a rising spiral and our costs of production threaten to reach a level so high as will reduce our export trade far below the subsistence level.

Tiredness, lack of enthusiasm, downright disillusionment are sapping our will to fight back; added to this the frustration caused by over-control has produced a new desire shown in willingness to emigrate. (According to a Gallup poll, 40 per cent of British people favour emigration.) The old system cannot be condemned out of hand because it permitted unemployment. Unemployment was then a world problem due to a form of mal-distribution of goods and effort. Then we were in the grip of a vicious circle. To-day we are again chasing our own tails, but this time there is plenty of work to be done, and therefore *for the time being* there is little unemployment. There is now a dead level of scarcity.

We say *for the time being* deliberately. Mr. A. C. Bossom, M.P., has pointed out to the Royal Society of Arts that it was to help us to "buy time" at this vital stage, that the U.S.A. had loaned us $3750 million. This so far has been spent with a not too cautious hand, and by autumn more than three-quarters will be gone. We shall then not be even halfway to regaining a self-sustaining position, and the possibility of national bankruptcy is to-day being recognised even in Cabinet circles. Meanwhile, austerity production, to which we have been committed, trains men to make austerity goods, but fails to prepare them to make better or craftsmen's articles. It is generally true that many of our competitors in the export markets are going ahead faster than we are, especially in enhancing quality. The evident danger is that we shall not even maintain our position in the overseas markets. The Bretton Woods agreement is held by many to be a further handicap when it comes into force.

News from Government sources this week shows there is before us a period of severe difficulty, of further belt-tightening, of reduced standards of living, and the possibility of widespread unemployment if we do not change our ways. Over-taxation and over-control (as Mr. Bossom says), have brought an end to other empires. This, then, is a period in our history at least as grave as 1929, and, as then, a time when it can reasonably be expected that all men of good will of all political parties will pull together. It is the time for restoring the National Government.

It is too early to comment on the new Bill published by the Government at the beginning of this week, under which they propose to take wider powers over industry, commerce and agriculture. This Bill will empower Ministers to put into effect the proposals announced by Mr. Attlee on Wednesday. Whether these proposals will have the effect intended, or whether they will further add to the frustrations of industry remains to be seen. Whatever the effect may be, the Government's action is in the nature of a desperate last-wicket stand.

NOTES AND COMMENTS

Odd Olfactories

IN our issue last week reference was made to the Home Office leaflet on "Fumigation with Methyl Bromide." In the leaflet is mentioned the fact that "the smell of the gas is so faint that many people cannot smell it even when definitely harmful concentrations are present." The leaflet adds that people coming into frequent contact with the gas may lose what powers of detection they previously possessed. This interesting note on the lack of perception of odour by some people should call attention to the shortcomings of the nasal organs of many people. Although in this report it mentions the faint smell which cannot be detected by some of is, it is a fact that comparatively strong odours are sometimes not detected by a large percentage of people. Recent correspondence in a contemporary has drawn attention to the insensitivity of some individuals to the odour of prussic acid. In one instance where eleven people were given a quick test, no less than five were not conscious of a smell when they sniffed at a potassium cyanide bottle. The other six reported a distinct odour of bitter almonds. Other investigators reported a ratio of about three non-smellers to five smellers, there being little difference between males and females. It is not known, however, if frequent contact with HCN gas promotes insensitivity of smell as is the case with methyl bromide. One interesting point mentioned was that a German professor used to advise his students to smoke a cigar while working in the laboratory, as by this means the presence of free cyanogen was instantly detectable.

Characteristic Smells

THE question of chemicals and their characteristic smell is one which has been taken too much for granted. Textbooks tell us, for instance, of the bitter almonds smell of hydrogen cyanide. But this, one of the first tests to be carried out, as it involves no setting up of apparatus—would fail three people in eight; and how many chemists cannot smell H_2S or SO_2, we wonder. How many more by frequent contact with these gases in college laboratories have since lost their sense of smell for these gases? This failure to register smell may, we think, be classed with the failure of other senses to register when we become "acclimatised" or "used" to something. We can, for instance, get accustomed to noise, warmth, discomfort and a dozen other unpleasant things. It may be that we can get "accustomed" to a certain smell and fail to notice it, *i.e.*, if we were some of the lucky (*sic*) ones who could smell it in the first place.

Dangerous Familiarity

AMMONIUM nitrate, like a host of other chemicals, has long been regarded as innocuous as coal or any other industrial material. And like coal in the mines it is capable of exacting a fearful penalty when incautious handling and the untimely spark occur together. The distinction between common fertiliser materials and high explosives is finer than is commonly recognised. Gross risks are taken daily, usually with impunity, with familiar substances—then one day the volcano erupts. It erupted once in 1921 in Oppau in Germany and half a town went down in ruins. A great dump of nitrate, exposed to wind and weather, had solidified and to disintegrate it explosive charges and detonators were drilled into it . . . and fired. Had the material been T.N.T. the devastation could not have been more complete. In the port of Texas City in April this year a fire, the cause of which was never definitely established, reached the laden hold of the nitrate ship *Grand Camp*. The trail of fire and explosions which followed destroyed much of Texas City, most of the Monsanto Chemical Works and cost some 600 lives. In Brest last week ammonium nitrate in the American ship *Ocean Liberty* added to its toll 21 lives and an area of wreckage which has been compared with the effects of a heavy bomber attack. In the light of these facts, the necessity of applying to ammonium nitrate and to some of its equivalents the safeguards of life and property required in the handling of other unreliable materials in bulk concentrations cannot longer be evaded. Because there has as yet fortunately been no major mishap in the shipment or processing of nitrate in this country, the belief that "It can't happen here" seems to have conditioned such regulations as are in force.

In most of them nitrate, as such, is not mentioned and its inclusion depends upon the interpretation of the description "any substance which may be explosive." Some of the several authorities concerned with industrial and maritime safeguards are now studying the variously derived nitrates in the light of the recent calamities. It is sincerely to be hoped that they will take a chemist's view of their subject, and recognise that ammonium nitrate (like cordite or petroleum) is a harmless and useful material so long as elementary safeguards are enforced—and a potential destroyer if they are not.

"Technical Universities"

THE Parliamentary and Scientific Committee, which comprises representatives of 70 scientific organisations, some 200 M.P.s and peers of all parties, has just adopted a report which, if fully implemented, will profoundly improve the status and extend the scope of technical colleges and go far towards closing the gap which exists between demand and supply of technologists for industry. The findings of the special sub-committee, on which chemical industry is well represented, have now been submitted to the Minister of Education with, apparently, good prospects of acceptance, since the general trend of the proposals accords closely with expressed policy of the Ministry. The need for the greatest possible aid being given now to the technical colleges was indirectly underlined in the same committee's report last December on the rôle of universities in providing scientific manpower, which indicated that university facilities were already being strained to the limit, and academic scientists cannot, in any case, immediately adapt themselves to technological problems. The committee further points out that the study of selected branches of technology is a problem which cannot be solved by devoting to it a post-graduate year (as has been suggested in the past) and recommends that tuition in those branches, together with the appropriate basic scientific foundation, must be the function of technical colleges with greatly extended resources and should lead to the award of a degree which will attract men and women of high ability. These recommendations clearly indicate a fundamental departure from long established academic traditions and manifestly will require the closest possible safeguards to ensure that the value of our academic coinage is not debased, as it has been in some other countries. It is reassuring to note that the committee is unanimously agreed on the need of vigilance in this regard, although it has yet to determine to what extent it is desirable to differentiate the title of a specialist technological award from the bachelorship, mastership or doctorate, conferred by the universities. These, however, are subsidiary issues to the principal result, which is that an influential body is wholeheartedly backing better and fuller opportunities for providing highly trained technicians, who are one of industry's greatest needs at the present time.

Staggering Difficulties

THE scheme for the staggering of hours which is to come into effect on October 1 and which may form part of the Government's panic measures to deal with the economic crisis—a crisis we have been warning our readers about for the past 18 months—is coming up against many unforeseen difficulties. One of these has been brought to our attention this week. It is that young men and women, who are studying in their spare time for science degrees, may find that their hours of leisure under the staggered scheme, do not coincide with the hours of lectures at their colleges or institutes, and that even their hours of practical work in laboratories may have to be reduced. The fact is that the staffs and facilities of all science instructing institutions have been so stretched already that it is impossible to extend the present number of lecture hours and laboratory hours without first finding extra staff, and perhaps accommodation. This problem of further education and training for would-be chemists who may have to stagger their hours is proving a headache to many heads of institutes and colleges. Full-time students are not affected—it is only those who may have to work at times when normally they would be at lectures or in the laboratories. We think the Government and employers must relax the conditions in the case of young men and women who have or are going to enrol for further training and education in their spare time. If they do not relax them, then the present shortage of scientists will be accentuated.

Atomic Progress Too Slow

Official Inquiry Sought

THE progress of the Government's first atomic energy plant, at Harwell, Berks., has been unreasonably delayed and the public is not being given sufficient information about it. This is the conclusion of the Select Committee on Estimates revealed in a report published on Tuesday, which recommends that an inquiry should be held immediately. In response to the committee's recommendation that as much information about the plant should be published as is consistent with security, the Ministry of Supply has appended to the report a note which states that it is hoped to put the first atomic pile into operation late this year. The pile consists of "several hundred tons of very pure graphite into which is inserted several tons of uranium metal."

Polish Chemical Industry Production in 1946

THE output of the leading products of the Polish chemical industry in April, 1947, was as follows, the figures in parenthesis (where given) being those for April, 1946:—

Tar products, 14,680 tons (5142); benzol products, 2157 (5800); carbon electrodes, 413; explosives, 870; organic dyestuffs, 156 (104); oil paints and varnishes, 209 (652); zinc blende, 663; ultramarine, 34; pure acetic acid, 27; nitrate fertilisers, 8718 (32,237); superphosphates, 11,465; oxygen (in thousands cu. m.), 290 (311); sulphuric acid, 2782 (16,146); hydrochloric acid, 327; ammonia, 522 (15); acetylene, 2073 (76); ammoniacal soda, 7390 (7902); caustic soda, 2260 (948); soap, 400 (1079).

World's Oldest Company

Thought to be the oldest commercial undertaking in the world, the Stora Kopparbergs Bergslags in central Sweden was the subject of an interesting study in the *Anglo-Swedish Review*, which recalls that when the company—now one of the leading producers of iron, electricity and forest products—received its first charter in 1347 it was already old established. The earliest document relating to the undertaking's activities producing copper from the Falun mine is dated 1288.

Geological Survey.—The Zinc Corporation, it is reported, is to carry out a geological and geophysical survey of a 2790 acre tract of territory adjacent to the lead-zinc leases acquired by Mount Isa Mines in Queensland.

1938 Values Doubled

Records of Chemical and Metal Prices

FURTHER evidence of the continued rise in world prices of chemicals, non-ferrous metals and most other basic goods to more than double the values obtaining in 1938 is provided by the current Board of Trade summary of import and export totals in the first and second quarters of this year and the last quarter of 1946. The declared value of our imports of chemicals, drugs, dyes and colours in the second quarter of 1947 was £6,880,000; expressed in 1938 values, the total value would have been £3,328,000. Equivalent comparisons in other departments of industry were: Non-ferrous metals and manufactures, 1st quarter 1947, £19,229,000 (1938, £8,404,000); manufactured oils, fats and resins, £18,809,000 (1938, £9,423,000). The upward trend showed a further strong movement in the second quarter of this year, as revealed by the index numbers of average values of most manufactures, regarding 1938 values as 100. Imported non-ferrous metals, for example, on this basis were rated 164 in the last quarter of 1946 and rose to 229 in the first quarter of 1947. A noteworthy exception, however, was the index number of foreign chemicals and allied products, which at the end of last year had reached 231, dropped to 217 in the first quarter of this year and to 207 in the second quarter.

British Goods Still Appreciating

A similar comparison of U.K. exports reveals generally a continued rise in our export values. The index number of chemicals, etc., was rated 196 in the last quarter of 1946, 197 in the first quarter of this year, and 216 in the second quarter. Equivalent figures for British non-ferrous metals were 160, 167 and 186; the continued increase in values of oils, fats and resins was equally marked.

Far less satisfactory is the reduced volume of U.K. exports since the end of 1946 when the total was equivalent to an index number of 111. In the first quarter of this year it was 101 and in the second quarter 102. The corresponding figures for chemicals, drugs, dyes and colours were 161, 139 and 131 and for non-ferrous metals and manufactures 194, 164 and 166.

Soviet Seize Anglo-U.S. Refinery.—The seizure by the Soviet authorities at Lobau of the largest oil refinery in Austria which is jointly owned by the British Shell Company and the Sacconi Vacuum Company of New York is reported from Vienna. The refinery, it is stated, was taken over by an armed party without reference to the Austrian Treaty Commission.

CHEMISTS' RESPONSIBILITIES

MASTER OF BALLIOL'S REMINDER AT S.C.I. DINNER

A VISION of chemists occupying in the not distant future a position of authority in world society equivalent to that of the Church in the Middle Ages was presented in convincing terms to the Society of Chemical Industry at the annual dinner at the Connaught Rooms, London, W.C.2, last week. The speaker was the Master of Balliol (Lord Lindsay of Birker), the principal guest among a company of 187 presided over by Dr. L. H. Lampitt, president of the society. The company included two past presidents, Drs. Herbert Levinstein and William Cullen, the society's 1947 medallist Dr. R. T. Colgate, and the Jubilee Memorial lecturers, Mr. J. Curtis (U.S.A.) and Mr. H. W. Cremer.

Internationalism of Science

The Master of Balliol, proposing the toast of "The Society of Chemical Industry," with which he coupled the name of Dr. Leslie Lampitt, promised to avoid the familiar opening gambit of wondering aloud for the space of quarter of an hour why he had been chosen to speak. He bore in mind that it had been said of one of his predecessors at Balliol that "He had like to have been preferred by Queen Elizabeth had not his prolixity interfered with public business." He knew very well, he said, that he had been chosen to speak because he was not a scientist. In the prehistoric age when he went to school in Glasgow you did not do science unless you were a very odd fellow. So he had been accustomed to think of industrial chemists as men who used to do extraordinary things with coal—when there was coal to do it with. But, although he knew no science at all, he had become increasingly aware of science. When he first went to Balliol all the smells from the old laboratory were directly beneath the dining hall, so that one was very well aware of the existence of science there.

At the present, he had a great concern for scientists, and especially for those who had lately been associated with the international meetings of scientists. He invited them to think about the international meetings of scientists. He invited them to think about the international aspects of science and the fact that at a time when nationalism had been getting worse and there were more and more causes for division in the world there had continued to flourish the Utopian flower of international science.

This internationalism was a wonderful thing and had flourished in science more than in any other of the arts. Even philosophy had not the international language that science provided. He had noticed in the last 20 years that this thing was growing stronger and stronger. He had also noticed the other day in *Pravda* or *Izvestia*—"or one of those beastly things"—that secrecy was being enjoined on Russian scientists. Those journals had discovered science—and were frightened of it.

He believed that in the 20th Century science had won its battles by becoming a neutral, and because it was neutral had been allowed to do all kinds of things other people were not allowed. Now, fairly suddenly, people at large had begun to say that "Science teaches us," rather as, in another age, they had said "The Church teaches us." Perhaps they were equally mistaken in both cases.

But he was "fearfully excited" about this manifestation. Science was beginning to be somewhat in the position once occupied by the medieval Church, as an international society whose word was listened to. Some even had been worried about their duty to international chemistry, as opposed to their duty to their country. That trend was coming again and he wanted it to grow. Scientists now were beginning to be aware of it and were beginning to make a fuss when politicians sought to make science a hush-hush, secret thing.

Responsibility and Power

He believed now that they were going to occupy a unique position in the world because of their internationalism. With power went responsibility. They wielded now the power to kill on a scale which in the past had belonged to armies, or to provide the means of living. He did not think there had been in the history of the world just such a thing. They were a young society with real power. The atom bomb belonged perhaps chiefly to the physicists, but, he gathered from the best people that chemists could do even filthier things if they gave their minds to it.

It was easy for scientists to think internationally. Now that they had got this international society he urged them to have faith in that and in collective responsibility and to say that they had got to know how this new power was going to be used. Industrial chemists were now in a position to put the claim across forcibly.

Dr. Lampitt, responding, said that before the dinner he had thought that his "theme-song"—collaboration in the international sphere—would be out of place. The Master of Balliol had, however, put the ball at his feet. Chemists had been well aware of their power and the last speaker had obliged them to think whether they as a body were going to take responsibility for the constructive and destructive forces they had placed in the hands of others. He was rather appalled by the realisation that mixed up with all their thoughts for the application of science to industry were also the results—which they had got to face—produced by the innate curiosity of man.

The Prime Minister, in a recent speech, had seemed to encourage the view that there were malevolent industrial groups which were delaying the application of the results of laboratory research to everyday uses. There was no truth in this. They, as chemists, knew full well that months or years necessarily elapsed before the work they had done could be brought to fruition.

Oldest Society

As recent examples of practical achievement they had such things as penicillin, which members of their society had helped to develop, and DDT. Theirs was an old society, old in the sense that the application of science to industrial ends was of very recent existence. They were, in fact, the oldest society of industrial chemists in the world, although the name of the society did not make their function clear, as it was in the titles of those more recently formed societies in France and elsewhere overseas. Because of that obscurity they had commonly been mistaken for a commercial organisation, as he had discovered in the period in which he was the society's treasurer.

They had hidden their light under a bushel, but, none the less, their work had gone on and the world had continuously reaped the benefit of it. The Master of Balliol had spoken of their responsibility to world society. He cordially thanked him for having made them aware of their duty.

Dr. L. H. Lampitt's table

The toast of "The Visitors" was proposed by H. D. Potter and Dr. Roche Lynch, in the course of his reply referred to the gratification caused by the presence of the Master and Wardens of the Salters' Company, who had rendered great service in promoting the advance of chemistry.

S.C.I. Luncheon

The most enduring impression of the luncheon, at which Mr. Julian Leonard, chairman of the Chemical Engineering Section, presided, was the characteristically witty speech in which Mr. C. S. Garland, a founder member to whom the chemical engineers owe much of the credit for their present strong organisation within the society, proposed the toast of the various sections and their chairmen, associating with the toast the name of Mr. Leonard. Emphasising the unique nature of the gathering, comprising all the sections and groups, he maintained that the luncheon disproved Euclid's axiom; that was an occasion when the sum of their parts was much greater than the whole. He endorsed the theory that there should be a closer affinity between a chemist in Nottingham and, say, a chemist in Manchester than with that chemist's next-door neighbour. Similarly, chemical engineers had a closer affinity with each other than with the chemists of food or agriculture. Chemical engineers had rendered good service to the community, being responsible for the maintenance of many sides of industry, and, unlike some others, they did not leave the job "when they dam' well pleased."

Mr. F. Curtis, of Monsanto, in conversation with Dr. Lampitt

He took next in order of importance the Plastics Group, who supplied their every need from the cradle to the grave, including in the end a "Bakelite" coffin, and whose only omission had been their failure to supply us with synthetic coupons. The importance of the work of the Food Group had increased greatly since the piping days of peace (when good food could be bought for 12s. 6d. a bottle), and the Nutrition Panel had also a very important rôle which had necessitated several visits abroad, which themselves were a useful pointer—"If you want good food you cannot do better than follow the Food Group."

A view of the dance floor at the Connaught Rooms during the reception and dance

The most important achievement of the Agricultural Group had been their work on selective weed killers. He disregarded for the moment the fact that they had, when asked to deal with the weed on his lily pond, recommended him to buy some ducks—which subsequently devastated his garden. He recommended to them the job of finding a selective killer which would wipe out the whole of our enemies while leaving our friends standing.

Responding to the toast, Mr. Leonard said the Chemical Engineering Group was honoured in having been called upon to provide the chairman on the unique occasion of the gathering together of all the groups of the society. Their group was older by more than 30 years than any of its brethren and was entitled to be regarded as the uncle of the groups, one of which had produced progeny in the form of the Nutrition Panel. All the groups, he was glad to say, worked in close and increasing co-operation and had a common bond in chemistry. Best of all, all the groups were "extra territorial" and their work was not confined within that of any one section. Thus the interest which members of their groups took in each others' activities was not confined to members of the same section.

Dr. M. A. H. Tincker, chairman of the Agricultural Group, who proposed the health of the guests, noted that many of them had come from afar, from overseas and from the Colonies, and brought with them a happy contact with other spheres of thought, helping perhaps to prevent us from becoming introspective. On behalf of the Agricultural Group he was very happy to extend a warm welcome to Mrs. Lampitt and to Sir John Russell, a former president of the society. Sir John, replying, expressed the warm appreciation of the guests of the delightful entertainment they had received and of the opportunity of meeting old friends and colleagues from overseas.

INSTITUTE OF METALS

39th Annual Autumn Meeting

THE thirty-ninth annual autumn meeting of the Institute of Metals is this year to be held in Glasgow from September 23-26 at the invitation of the Scottish local section. A comprehensive programme drawn up for the occasion embraces the social as well as the more serious aspect of the Institute's activities. A civic reception is scheduled for September 24, and a dinner and dance for the following day. Four (and possibly five) papers recently published in the Institute's Journal will be discussed, while a number of works visits have also been arranged. Ladies' interests are to be sustained by a visit to the Trossachs and places of historial interest.

British Glues' Development Programme

A £300,000 programme of reconstruction and development for factories of British Glues & Chemicals, Ltd., was referred to by the chairman (Mr. Roger Duncalfe) in his speech at the recent annual general meeting.

The effects of the fuel crisis could be seen in the slowing up of deliveries of structural equipment, plant and machinery required for development purposes. This, explained the chairman, had impaired the company's production plan, and could only aggravate the shortage (both at home and abroad) of the essential products manufactured by the company.

"Engineering and Technical Qualifications" is the title of a 27-page booklet just published by the Advisory Bureau for Research. Its object is to encourage specialisation, which can be achieved "by publishing articles in the technical Press and delivering papers before the technical societies or institutions."

SILICON ORGANIC COMPOUNDS—I

Wide Adaptability of Silicones and Silicon Esters

by A. E. L. JERVIS and K. MOCHLINSKI

IN our issue of July 13, 1946, a few notes were published on the uses of organic compounds of silicon. Brief reference was made to silesters, silanics and silica white. In the year which has elapsed the authors have had the opportunity of an uninterrupted study of this subject, the vast field of which is shown in Fig. 1, and on which current literature is very scanty—at least on this side of the Atlantic.

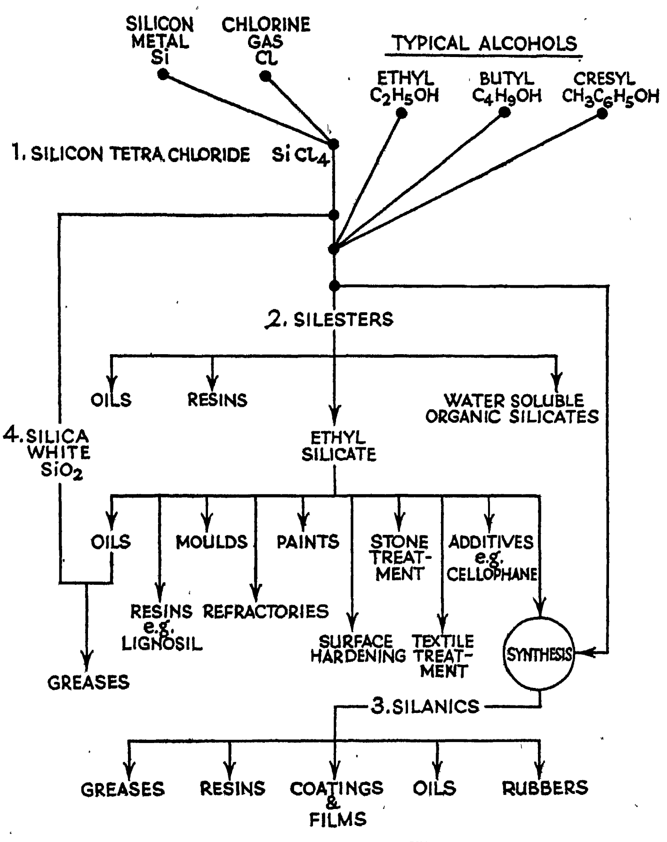


Fig. 1. The vast field of silicon organic derivatives

There are alternative definitions of organo-silicon compounds—strictly such a compound is one containing silicon and carbon atoms directly linked as in the silicones. In this case it will be remembered that there is a chain of -Si-O-Si atoms, terminated by a carbon atom at each end, the two remaining arms of each silicon atom carrying two further carbon atoms. In each case the carbon atoms are part of a hydro carbon radical, such as C_2H_5 (ethyl) CH_3 (methyl) and C_6H_5 (phenyl).

A broader definition is any compound which contains carbon and silicon atoms not necessarily directly linked.

This lets in many interesting materials such as ethyl silicate and tetra cresyl silicate (which is suggested as a heat transmitting liquid at 380°C.) about which more will be said later.

History

Some of the outstanding events in the organo silicon field are shown in Fig. 2. For reasons of space reference here is confined to Professor Kipping's work. In 1896, in conjunction with the late Professor Sir William Jackson Pope, Professor Kipping had successfully concluded certain researches on optically-active camphor derivatives. He then decided that it would be interesting to find out if silicon compounds behaved in a similar manner. Eleven years of hard work followed, and in 1907 the first active silicon compound was obtained. During this work, several of the so-called silicones were prepared. In all, Professor Kipping and his co-workers devoted over 40 years to the organo-silicon field and their findings are certainly worthy of examination.

Silicones and Silicon Esters

Although the word "silicone" is a misnomer, it is one which is very easy on both the tongue and the ear and it has come to stay. Silicones are however more correctly covered by the heading "Silanics" as shown in Fig. 1, while esters (an ester is the product of an acid and an alcohol) come under the heading "Silesters."

It is however interesting to note that there are at least five groups of silicon esters:

1. The esters of ortho silicic acid—in which all four silicon valencies are attached to carbon through oxygen.
2. Esters of the polysilicic acids.
3. Esters which contain a halogen atom directly attached to a silicon atom.
4. Esters which contain carbon atoms directly attached to silicon atoms.
5. Esters which contain two or more silicon atoms directly linked. Fig. 8 will be found helpful in considering these esters.

The best known silicon ester is ethyl silicate, Fig. 6, and, apart from a brief reference to tetra cresyl silicate, it is the only one to be considered in the present article.

Manufacture of Ethyl Silicate

Ethyl silicate was first prepared by Ebelmen in 1846 and is now manufactured in this country at the plant of Messrs. Silicon (Organic) Developments, Ltd., at Bridgend, where photographs 3, 4 and 5 were taken. It is made by reacting silicon tetra chloride with ethyl alcohol, leaving hydrochloric acid as a by-product, as shown in Fig. 7.

The substance has many applications, ten of which are listed in Fig. 1. When ethyl silicate is reacted with commercial alcohol containing, say, 6 per cent water (methylated spirits, for example) there is deposition of silica (SiO_2-silicon di-oxide) and this process has been commercialised in connection with the protective treatment of stonework. It can be used either for the restoration of old stonework, or to prevent erosion.

The commercial application of the process is, of course, a highly specialised technique and architects and builders in collaboration with chemists have given much time and thought to the problem.

Very efficient keyed impregnating coatings on both new and old stonework can be obtained using mixtures of ethyl silicate and alcohol. In certain cases the work takes on the nature of a surgical operation, parts of the stone being cut away and fresh pieces inserted in conjunction with the ethyl silicate treatment. It is interesting to note that varying colour effects can be incorporated in the ethyl silicate mixtures.

When blended with suitable admixtures silicon esters are valuable as fire resistant

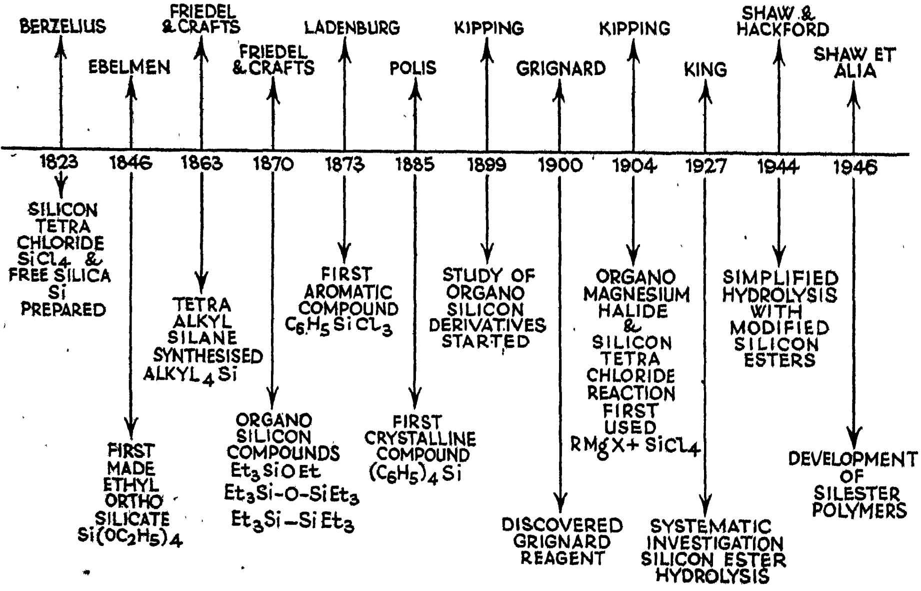

BERZELIUS
FRIEDEL & CRAFTS
LADENBURG
KIPPING
KIPPING
SHAW & HACKFORD
EBELMEN
FRIEDEL & CRAFTS
POLIS
GRIGNARD
KING
SHAW ET ALIA
1823
1846
1863
1870
1873
1885
1899
1900
1904
1927
1944
1946
SILICON TETRA CHLORIDE SiCl4 & FREE SILICA Si PREPARED
FIRST MADE ETHYL ORTHO SILICATE Si(OC2H5)4
TETRA ALKYL SILANE SYNTHESISED ALKYL4 Si
ORGANO SILICON COMPOUNDS Et3SiOEt Et3Si-O-SiEt3 Et3Si-SiEt3
FIRST AROMATIC COMPOUND C6H5SiCl3
FIRST CRYSTALLINE COMPOUND (C6H5)4Si
STUDY OF ORGANO SILICON DERIVATIVES STARTED
DISCOVERED GRIGNARD REAGENT
ORGANO MAGNESIUM HALIDE & SILICON TETRA CHLORIDE REACTION FIRST USED RMgX+SiCl4
SYSTEMATIC INVESTIGATION SILICON ESTER HYDROLYSIS
SIMPLIFIED HYDROLYSIS WITH MODIFIED SILICON ESTERS
DEVELOPMENT OF SILESTER POLYMERS

Fig. 2. Some of the outstanding events of organo silicon chemistry

Fig. 3. Weighing the liquid chlorine, of which there are approximately 70 lbs. in each container, for the experimental production of ethyl silicate

Fig. 4. Silicones experimental unit. Falling films stripping apparatus for removing volatile solvents from silicon compounds

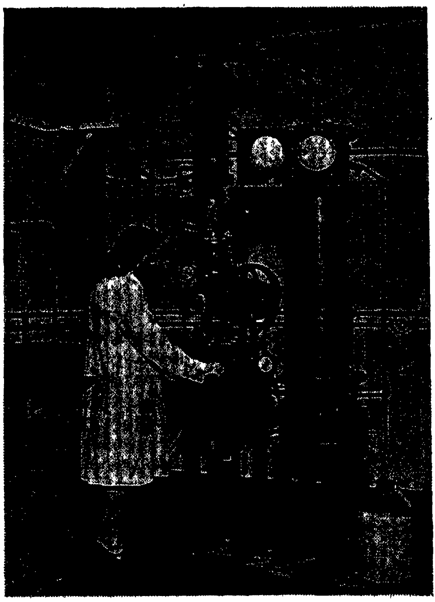
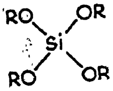


Fig. 5. This stirred steam heated reaction vessel, for treating silicones and silicon esters is fitted with reflux and product take-off condensers

coatings, because, on hydrolysis, they form a layer of pure silica on the materials they are intended to protect.

Used with paint the ester gives a permanent siliceous binder which is chemically inert, unaffected by heat, weather or mechanical attack, and which will not interfere with the brilliance of the paint pigment. In this country, during the war, silicon ester coatings were used in the fireproofing of self-sealing petrol tanks, and in America they have been employed for protecting theatrical scenery against fire.

The chemical structure of ortho silicates can be shown thus:



Where Si = silicon
O = oxygen
R = an organic radical.

In the case of ethyl ortho silicate the organic radical R = Et = ethyl = C_2H_5. The chemical structure can therefore be shown thus:

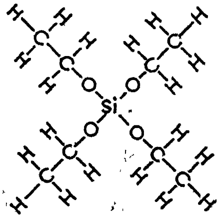
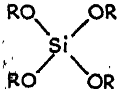


Fig. 6. Chemical structure of ethyl ortho silicate

A new resin, "Lignosil," made from ethyl silicate, is suggested as an alternative (or as an admixture) to phenolic resins. The most striking claim made for this new resin is that it will bond cellulosic materials such as saw-dust, wood flour, paper, cotton, wool, etc., when used in a proportion as low as 4 per cent of the total mixture, which is much lower than in the case of phenolic resins. The curing is based on the ester interchange reaction between cellulose and the silester resin under heat and pressure in a manner similar to techniques used for phenol formaldehyde resins.

Other liquid organo-silicates which are arousing considerable interest at the moment are the tetra-aryl-ortho-silicates. Here again the broad chemical structure is as shown in Fig. 6. R can be, for example, a phenyl or a cresyl group. For the sake of simplicity only one compound will be considered, namely, tetra-cresyl-silicate. This liquid can be used as a heat transfer medium for temperatures up to 380°C., without pressure. (Its boiling point is between 435° and 440°C.) In the past many substances have been considered as heat transfer media as alternatives to water and steam. These include petroleum, certain fused salt mixtures, mercury and so on. All of these have certain disadvantages, the fire hazard with petroleum is well known; the cost of mercury is high; certain salt mixtures freeze at temperatures as high as 300°F. and so they cannot be used at normal room temperature.



1. Ethyl silicate is an ester, *i.e.*, the product of an acid and an alcohol.

2. The broad chemical reaction involved in its production is as follows:

$$4ROH + SiCl_4 \rightarrow 4HCl + Si\,(OR)_4$$

Alcohol + silicon tetra chloride gives Hydro chloric acid + ethyl ortho silicate

3. In our case the organic radical R = Et or in full C_2H_5.

4. The expression can therefore be written:

$$4C_2H_5OH + SiCl_4 \rightarrow 4HCl + Si(OC_2H_5)_4$$

Ethyl alcohol + Silicon tetra chloride gives Hydro chloric acid + Ethyl (ortho) silicate

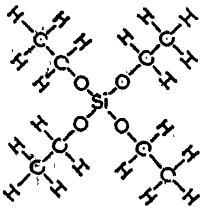


Fig. 7. The production of ethyl silicate

The advantage of tetra cresyl silicate is that the change in viscosity is so small that it remains liquid at low temperatures and small pipes allow sufficient flow.

Silicones

For the purposes of this article and for comparison with existing electrical insulating materials, silicones can be considered in five groups; rubbers, ceramic and glass coatings; resins and varnishes, liquids, and lubricants, greases and sealing compounds.

The derivation of silicones is interesting and is shown in Fig. 9. As regards their chemical structures they can be straight chains, branched chains, or cyclics as shown in Fig. 10.

All members of the silicone family exhibit the following characteristics; temperature stability; chemical inertness; moisture repellency and good electrical properties.

The need for a heat-resistant insulation for electrical leads, and for a satisfactory

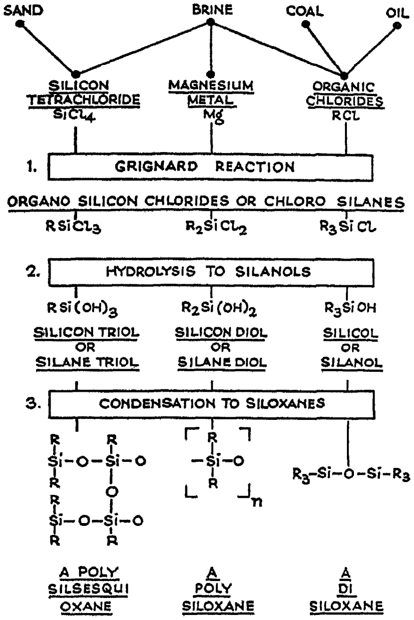


Fig. 9. Derivation of silicones

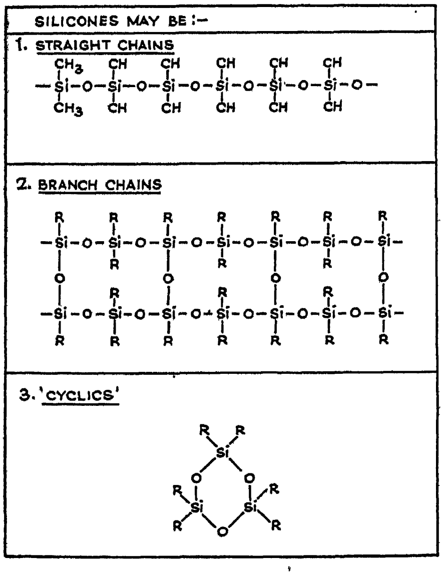


Fig. 10. Structure of silicones

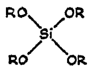
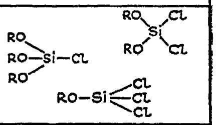
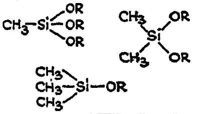
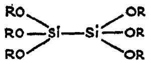
1. THE ESTERS OF ORTHO-SILICIC ACID IN WHICH ALL 4 SILICON VALENCIES ARE ATTACHED TO CARBON THRO' OXYGEN	
2. THE ESTERS OF THE POLYSILICIC ACIDS THESE CONTAIN SILOXANE GROUPINGS AS SHOWN	$\equiv Si-O-Si \equiv$
3. ESTERS WHICH CONTAIN A HALOGEN ATOM DIRECTLY ATTACHED TO A SILICON ATOM, FOR EXAMPLE	
4. ESTERS WHICH CONTAIN CARBON ATOMS DIRECTLY ATTACHED TO THE SILICON ATOM, FOR EXAMPLE	
5. ESTERS WHICH CONTAIN TWO OR MORE SILICON ATOMS DIRECTLY LINKED	

Fig. 8. Types of silicon esters

gasket material for very high temperatures, has speeded up the development of silicone rubber. Its performance under extremes of temperatures and humidity suggest that it is superior in many respects to the more common natural and synthetic rubbers.

A typical silicone and a good quality synthetic rubber were tested together. The former, after a year at 300°F., had hardened only slightly, whereas the latter became hard and inflexible after only 35 hours. Silicone rubber has been used for long periods at 500°F. in the form of gaskets for drying and baking ovens. It retains its flexibility at a temperature as low as - 70°F., and it is claimed to have softness and resilience equal to natural rubber, but it has somewhat lower tear resistance and tensile strength. During the war, for production reasons, the use of silicone rubber was concentrated on gaskets for navy searchlights and aircraft superchargers working under very difficult thermal conditions. As a gasket material it outlasts both ordinary rubber and asbestos because of its better thermal resistance and its greater humidity resistance. It does not adhere to metal and it is unaffected by oils.

More recently, silicone rubber has attained prominence as high temperature electrical insulation. Several compositions have been developed having very good insulating properties, suitable for processing on standard rubber fabricating equipment.

Silicone rubber is also used for flexible insulating sleeves, radio equipment, anti-vibration mountings and coatings for wire-wound resistances.

(To be continued.)

IMPROVEMENTS IN POWDER METALLURGY

TWO NEW AMERICAN PATENTS

INTERESTING patents relating to metal powders have lately been issued in the U.S.A., for some of which applications date from 1940 or thereabouts. Presumably they are among the fairly large number kept secret during the war.

The first is for the production of powdered iron and sintered articles therefrom, by General Motors Corporation, the corresponding English patent application being 13370/1947, and Conv. date August 14, 1940. A mixture of finely powdered mill scale and powdered carbon iron alloy, such as white iron or steel, is heated at 1400-2000°F. in an atmosphere containing reducing gases to reduce the scale to iron without melting it and decarburise the white iron or steel particles. The amount of carbon in the white iron or steel is sufficient to combine chemically with the oxygen in the mill scale.

The mill scale is first comminuted to pass through 250 mesh screen and mixed with powdered white cast iron or steel. In making sintered articles the mixture of powdered materials is briquetted and sintered at a temperature of 2000-2100°F. in a non-oxidising atmosphere under a pressure of 30,000 to 100,000 lb./sq. in., including suitable binders, fluxes, die lubricants, or pore-forming materials. The reducing atmosphere suggested by way of example is a mixture of carbon monoxide 10-11 per cent, hydrogen 13-16 per cent, carbon dioxide 4.5-5 per cent, and the balance of nitrogen.

Rapid Sintering

The second patent is by Charles Hardy, Inc., and relates to improvements in powder metallurgy, especially to improved methods of applying heat. The corresponding English patent application is 13447/1947. It is pointed out that the proper sintering of powdered compacts sometimes takes days and is even then imperfect. The object is likely to be distorted, so that the required tolerances are not met.

In the present method sintering is almost instantaneous in the die, thus minimising distortion and saving time. The products are of high density with little or no porosity. The bonding together is achieved by heating zones or points of contact between particles to a temperature, preferably not exceeding the melting point, by passing through an electric current of such strength that the contact points reach the necessary temperature practically at once. The compact is compressed at the same time between electrodes in such a way that the bulk of the mass remains solid and relatively cool, although sufficiently plastic to eliminate porosity under only moderate pressure. The whole mass in fact remains relatively cool and can be handled with bare hands almost immediately after ejection from the die.

The electrodes must be strong and of metal which does not readily alloy with the compact elements. They will usually form a pair of plungers in the die, properly insulated with glass or bakelite or lined with flakes of mica or the like, or metal flakes of a malleable nature (*see* U.S.P. 2342037) in which die linings of orientated overlapping flakes of malleable material are used, *e.g.*, aluminium flake.

Either a.c. or d.c. electric heating may be used, and the strength will depend on the specific purpose or kind of compact. The shorter the time of heating the less is the risk of diffusion, and in this case there is practically none. By repeated application of current over short intervals diffusion can be controlled as desired.

Suitable material for electrodes is a tungsten alloy supplied by P. R. Mallory Co. under the name of Elkonite 100W. Almost any metallic flake material may be used: ordinary aluminium flake as employed in paints is satisfactory, containing a small proportion of leafing agent such as stearic acid. It is preferable, however, to add a certain amount of stearic acid, this and the metal flake being suspended in a suitable vehicle, such as benzol. Density of current used may be up to 2,000,000 amp./sq. in. for 1/60th of a second, voltage 5-20, and pressure 7½ tons/sq. in.

Oil Production in Morocco

A French Parliamentary sub-commission recently arrived at Rabat, Morocco, where it visited the Gharb Plain oil wells and toured the Petit-Jean refinery which was built at the beginning of the war. The commission's task is to investigate the possibility of industrialising the country. Development plans which have been drawn up by the Resident-General in co-operation with the Cherifian authorities, envisage large-scale prospecting for petroleum in the Gharb Plain. Between 1939 and 1945 about 31,000 tons were produced, nearly all of which was refined at Petit-Jean. Drilling equipment is understood to be obsolete and any extensive oil searches would seem to depend upon the arrival of new equipment from the U.S.A.

American Chemical Notebook

From Our New York Correspondent

AN unprecedented demand for new chemical processing plants has developed in the United States because present manufacturing capacity for chlorine and caustic soda are heavily overtaxed. This is the substance of a statement in New York by Mr. Wells N. Thompson, vice-president of the H. K. Ferguson Company, industrial engineers with widespread affiliations. Despite wartime expansions in the chemical field, says Mr. Thompson, the demand for new facilities is just as sharp in the United States as it is in other countries. During the war many manufacturers feared that the United States would have an over-supply of chlorine because of the number of new plants built. All these plants are still in use, he said, and several chlorine producers are expanding existing facilities and most inquiries for new facilities call for capacity in excess of fifty tons a day. During the war the H. K. Ferguson Company built and equipped four Chemical Warfare Service chlorine plants in Maryland, Alabama, Arkansas and Colorado, and also supervised construction of two of the largest chlorine plants in the world at Natrium, West Virginia and at Henderson, Nevada. To-day, notes Mr. Thompson, there is a growing tendency among manufacturers who ordinarily purchased chlorine to construct their own plants. That was true also in other countries, where industrialists were finding it worth while to build small plants which would not be considered commercially profitable in the United States.

* * *

The first tables in a new and comprehensive compilation of "Tables of Selected Values of Chemical Thermodynamic Properties" have just been announced by the U.S. National Bureau of Standards. Published data of chemical thermodynamic properties have been widely scattered, necessitating a search of the literature by those who require such information. The new tables bring all available data together for the first time in a form readily accessible to the engineer, chemist, and physicist in scientific and industrial research. With accurate values of the appropriate thermodynamic properties available, it is possible to calculate the optimum conditions for manufacturing processes involving chemical reactions. The selected values are presented in three series of tables which are internally consistent in that all the known physical and thermodyamic relations existing between the properties are satisfied by the tabulated values of these properties. The three series are: Series I. Heat of formation at 25°C.; Free Energy of Formation at 25°C.; Entropy at 25°C.; Logarithm of the Equilibrium Constant of Formation at 25°C.; Heat of Formation at 0°K. (Arranged as groups of compounds)—Series II. Heat, Temperature, and Entropy of Transition; Heat, Temperature, and Entropy of Fusion; Heat, Temperature, and Entropy of Vaporisation. (Including values of pressure as appropriate.) (As groups of compounds).—Series III. Heat of Formation; Free energy of Formation; Logarithm of the Equilibrium Constant of Formation; Free Energy Function; Heat Content (or Enthalpy) Function; Entropy; Heat Content or Enthalpy; Heat Capacity. (Values tabulated for individual compounds; from 0°K. to high temperatures. Complete references to the data from which the selected values have been obtained will be published by the bureau later. References to experimental data which may have been overlooked in the selection of values of a given property and similar supplementary information will be welcomed by the National Bureau of Standards in Washington, D.C.

One set of the tables, with supplements as issued, is being furnished to each University Department of Physics, Chemistry, or Engineering, and resarch institutions, and industrial laboratories may obtain one set each upon application to the Bureau.

* * *

Production of sulphuric acid in the United States in 1946 amounted to 8,649,163 tons, a slight decrease from the 1945 total, according to the Bureau of the Census, U.S. Department of Commerce. Areas of greatest production, in order of size, during 1946 were New York, Southeast, and Baltimore. In 1945, the three areas of greatest production were, in order, Baltimore, New York and the Great Lakes. The Census Bureau also reported that production of normal superphosphate fertiliser material in May was the highest for any month on record, with a total output of 803,501 tons, 5 per cent greater than April and 27 per cent greater than May, 1946.

* * *

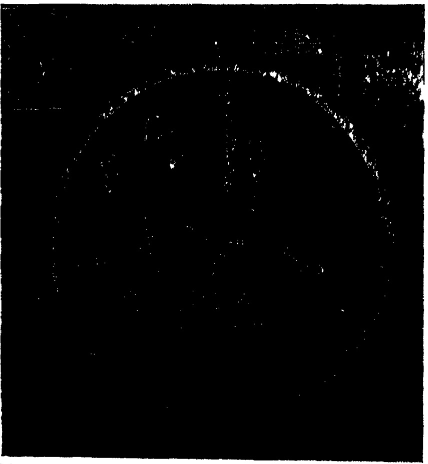
Sweeping reductions ranging from 10 to 25 per cent in the prices of major volume synthetic resins for the paint, varnish, lacquer, adhesive and printing ink industries have been made possible by the attainment of full production at the new synthetic resin plant at Burlington, New Jersey, of the Hercules Powder Company. Typical of the lower values is the new price of 16 cents per lb. for Pentalyn A resin, a 16 per cent drop, and 15½ cents for Hercolyn, widely used as a replacement for castor oil in protective coatings and adhesives. "This marks the first time," a company official said, "that a standardised pentaerythritol ester has sold for the same price as ordinary ester gum."

* * *

Nucleonics, a new monthly scientific magazine to be devoted to the peaceful uses of nuclear fission and covering the field of nuclear technology, as distinct from that of nuclear science, will make its first appearance in September under the sponsorship of the American publishing house, the McGraw-Hill Company. The new publication, combining three hitherto experimental magazines, will provide information on industrial, medical, and other applications of atomic power and its by-products. It will carry no advertising, and will be edited by Keith Henney who will be assisted by Walter M. DeCew, formerly of the Los Alamos project.

* * *

A 650 lb. plastic part, said to be the largest ever produced in the American General Electric Company's plastic division, has left the G.E. factory in Pittsfield, Mass., for the University of California, where it will be used as a component part of the university's newest atom splitting apparatus. Representing one of the most important projects ever attempted by the company's plastic division, which is the largest producer of finished plastics products in the United States, this synchrotron part measures 8 ft. in diameter. Together with nine additional G.E. plastics parts, it will form the vacuum chamber of the atom synchrotron where the physical properties of the plastics offer unusual strength and stability, combined with electrical insulation. It consists of seven rings, designed to bear the compressive load of the magnet, and three vacuum manifolds made of a low-pressure laminated construction to form the vacuum chamber in which electrons are accelerated. The plastic rings were made of layers of glass fibres bonded with a polyester resin. According to University of California scientists, the new synchrotron is designed to produce a beam of 300 million volt X-rays and combines certain features of the cyclotron with those of the betatron. Weighing less than either of the other two types, the new plant can explore the nature of materials with higher voltages.



Plastic synchrotron parts produced by the General Electric Co., plastics division, and used as component parts of the University of California's newest atom Splitting apparatus

* * *

Because American steel companies are determined to satisfy domestic demand before giving consideration to export markets, attempts of British buyers to place new contracts in America for steel deliveries to England have been unsuccessful, according to a spokesman for the British Iron and Steel Federation.

The British interests, which have been canvassing steel companies in the United States for the past three weeks, were able to " pick up only negligible tonnages," the spokesman said. Inquiries were generally met with the response that it would be " at least the end of the third quarter " before United States demand is satisfied sufficiently to permit volume shipments abroad.

Food Shortage Repercussions.—Because of the world food shortage, natives in Borneo are forsaking the copra plantations for their own food-producing gardens, reports the *New York Journal of Commerce.* This has resulted in a scarcity of coconut oil for soaps, shampoos, etc. The islands could produce 50,000 tons of copra for coconut oil a year, but last year turned out only 15,000 tons. Production of rubber is similarly being curtailed by the food shortage. Rubber output there this year is estimated at 20,000 tons out of a capacity of 50,000 tons.

Indian Linseed Oil for Australia.—Australian officials in New York announced this week that the Indian Government has given assurances that increased supplies of linseed oil will be shipped to Australia. In return, Australia has undertaken to allocate additional supplies of wheat for India on the understanding that adequate supplies are first made available for home requirements. The Australian Minister for Commerce and Agriculture, Mr. R. T. Pollard, said that the arrangement should be entirely satisfactory to Australian consumers and paint manufacturers. The amount of linseed oil expected from India this year is 6,500 metric tons.

IRON IN INDUSTRIAL WATERS—II

By a Special Correspondent

ANOTHER factor to be kept in mind is the formation of hydroxides in the presence of alkalies, a fact that is utilised in the lime-soda process of water-softening whereby iron impurity is also removed by the formation of insoluble ferric hydroxides which may then be removed by filtering through coke beds. The lime-soda treated water is sprayed from a great height by means of atomisers whereby oxidation of the slightly alkaline water supply occurs with the formation of iron hydroxide according to the equation

$$4\ Fe(HCO_3)_2 + O_2 = H_2O = 4\ Fe(OH)_3 + 8CO_2$$

A catalyst consisting of manganic oxide (as previously described in the use of manganese zeolite) may be provided for the oxidation process, or in this case the iron hydroxide itself will act catalytically when collected on the filter bed.

By this method the danger from iron contamination to the supply is not completely removed until the water has been further filtered through a bed of marble for the removal of carbonic acid liberated by the formation of ferric hydroxide from ferrous bi-carbonate according to the foregoing equation. The carbonic acid is thereby converted into calcium bi-carbonate by the equation

$$CO_2 + H_2O + CaCO_3 = Ca(HCO_3)_2$$

and the water rendered harmless insofar as any solvent action on the iron piping (from dissolved carbonic acid) is concerned.

Oxidation by aeration may also be carried out in closed equipment by blowing air under pressure through the water supply.

Sterilisation

Where algæic organisms and microbiological growths have contributed to the iron contamination of water supplies, some form of sterilisation may have to be considered. For this purpose chlorine is of great importance. The treatment will of course vary according to the extent of the pollution. In one instance, 4-minute duration dosages of 2-4 parts of chlorine per 1,000,000 parts of water were carried out every 90 minutes. Chlorination is especially valuable as it also provides a means of oxidation for the removal of iron, thus in certain cases dispensing with the necessity for aeration. Although chlorine is very effective as a bactericide and as an algæic growth preventative it is unstable in solution. Combination of chlorination with ammonia treatment provides a more controllable method of dosage. By this means are formed stable chloramines which break down very gradually and provide a slow but steady oxidising action.

The use of copper sulphate is also a means of cleansing waters of micro-biological infectons; 1 lb. per million gallons of water will suffice, but the possible danger of poisoning drinking-water supplies must be kept in mind when using this method.

German Patent No. 598,069 deals with disinfection of water supplies by the addition of very finely divided metals like copper and silver. In this connection also it may be noted that the use of silver and silvered sand has been shown to be very effective. It has been stated that 1 part of silver per 20,000,000 parts of water at *p*H7 will kill all bacteria in an hour.

Troubles from Iron in Water

Very large amounts of water are used in processing textiles in the finishing stages—desizing, scouring, bleaching, dyeing, printing and finishing require water supplies as free as possible from all types of impurity. It can readily be understood that fabrics of any description will act as very efficient filters for all impurities. In some cases there are even special affinities between fabric and impurities.

It is well known, for example, that cellulosic fibres of all types have a decided affinity for iron, manganese, silica, organic impurities, etc., present in water supplies. If algæ and bacterial growths are also present to any extent considerable damage may be done in the form of stains, etc. In the case of wool dyeing, the iron may react strongly with the dyestuffs used, to give flattened shades and in some cases blotchiness due to decomposition and separation of the dyestuff from the dye liquor.

In rayon treatments the danger may even extend to tearing where deposits of iron from pipe-line accumulations have come into contact with the fibre. In this case it is not unlikely that ferrous hydroxide will have formed in the material while lying in a damp state exposed to the air and perhaps in a slightly alkaline condition. Rayon readily absorbs ferrous hydroxide and as has been shown in another connection, the latter has the power of acting catalytically on a filtering medium to bring about further oxidation. In the present instance the rayon acts as a filter and the ferrous hydroxide is readily oxidised to the ferric state by the addition of atmospheric oxygen. However, the oxidising reaction may not stop there and it is possible that the addition of oxygen to the cellulose may be a cause of tendering by the formation of oxycellulose.

GOOD HEATING UNIT

New Coke Burner

THE contemporary importance of the coke-fired semi-producer furnace providing controlled heat without smoke or other waste and with the minimum attention is widely recognised. The design which has been produced by the London and Counties Coke Association in conjunction with the National Federation of Gas Coke Associations appears to supply the current need exceptionally well, giving the advantages of practically automatic firing without moving parts. These furnaces are made in standard sizes to burn from 20 lb. to 10 cwt. per hour. Large numbers are now in use in conjunction with plant for drying and heating all kinds of materials, and have been adopted as standard by various makers of drying plants. They are ideal also for steam generation, being a convenient and efficient "Dutch oven" arrangement for the operation of small steam boilers, such as the vertical and cylindrical types.

The design is that of a brickwork furnace of domed type containing a large combustion or gasification chamber which is kept filled with a deep layer of coke. Into this chamber air is blown from a fan with control by means of a cold air admission damper, while the setting also includes a gas port and a spark trap, the combustion being regulated according to the operation of the air inlet fan.

Good Gasification

Extremely good gasification is given without any excess air, and the gas is all burned with high efficiency on the same general lines, for example, as the semi-producer furnace used in the gas industry for heating the retorts. It gives continuous combustion without any excess air, that is with a high CO_2 and very low free oxygen content in the exit gases. This conrolled heating is given, as already indicated, without any moving parts and with the minimum of attention. The gasification is of course smokeless, and is easily controlled by adjusting the degree of the forced air blast.

Coke lends itself particularly well to partial gasification firing of this description, unlike bituminous coal, where the problem is complicated by the formation of black smoke by unburned volatile matter with deposits of tar and other familiar troubles.

Prices of Oils and Fats

The Ministry of Food announces that there will be no changes in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending August 30, 1947.

(Continued from p. 195)

Tendering of rayon may also occur as the result of micro-biological attack and where this coincides with the presence of iron there is likely to be trouble. In waters used for rayon processing, therefore, very strict control must be exercised over all water treatments. It is possible that contamination in the early stages of manufacture may not become evident until a much later stage when damage might be irreparable.

Alginaceous growths, whether of ferruginous nature or not, can be very harmful in textile processing. They are filtered out by the fabrics during wet processing and are very tenacious. Indeed, in certain types of processing such as bleaching where calcium salts are used there is some reason to believe that such algæ deposits tend to be fixed in the fabric. In addition, there are all the possibilities of harmful reactions where iron impurity is also present, as has already been pointed out. Furthermore, mildew may form readily in material which is left in a damp state for any prolonged period especially if water has become polluted from a sewage source. Composite stains and discoloration of this type are often difficult to remove when the nature of some of the treatments required is considered along with the reactive nature of some of the forms of iron impurity which may be present.

Removal of Iron Stains

Deposition of iron on textiles is almost certain to lead to staining of a more or less serious character. Oxidation and precipitation of iron oxides on fabrics is accelerated (as has been shown) by exposure to actinic rays in humid atmospheres and the presence of alkalis is very conducive to the formation of hydroxides. Removal of stains may be brought about by the use of a solution recommended by the British Cotton Research Association one oz. of oxalic acid and 1 oz. acid potassium fluoride in 1 qt of water. This solution can safely be used for local spotting of any type of textile fabric until the stains disappear. After thorough rinsing, dilute ammonia is applied.

Titanium Tri-Chloride

Another suggestion for the removal of obstinate iron stains is the use of titanium tri-chloride which is said to be particularly efficacious by reason of its great reducing power.

A patented Dutch method employs phosphoric acid and glycerine in the proportion of 25 parts of 65 per cent phosphoric acid and 75 parts of 28 per cent glycerine.

Citric and other organic acids may also be used in combination with the foregoing constituents.

NITRATE HAZARDS UNDER REVIEW

LOOPHOLES IN EXISTING REGULATIONS

SINCE the devastating explosion resulting from the ignition in Brest Harbour last week of a cargo of nitrate of ammonia, chemical authorities throughout the country have been studying with anxious interest the existing data relating to this unstable chemical to see what guidance has been given in the past to minimise the risk of explosion when nitrate is being processed or transported in this country.

The result of most of these inquiries has been to show that the potential risks associated with the chemical in certain circumstances have never been adequately recognised. Now, with two recent disasters to its discredit—Texas City and Brest—nitrate of various kinds has come to be regarded with extreme suspicion, which takes little account of the possibility that gross carelessness may have contributed to causing both the recent calamities. Dockers in some Continental and American ports have lately refused to work on nitrate shipments.

Not an Explosive

Ammonium nitrate is not an explosive scheduled by H.M. Chief Inspector of Explosives. That department is, however, understood now to be examining available data to decide whether the chemical should be added to the list of materials whose explosive potentialities are recognised and for which safeguards are laid down by statute.

Statutory provisions in general show little or no recognition that the combustible nature of ammonium nitrate is more marked than that of scores of other industrial materials. The Factory Acts provide no ruling applying specifically to nitrate. Section 28 of the 1937 Act lays down in general terms obligatory precautions relating to grinding, storage and some other processes of "any substance which may be explosive." These deal with such subjects as the enclosing of plants and safe dispersal of potentially explosive dusts.

Even the Chemical Works Regulations 1922, pay no special regard to ammonium nitrate, although in the light of recent events the general provisions relating to the safeguarding of combustible materials of all kinds from naked lights now appear to have a very definite application in this regard.

The shipment and use of nitrate come within the sphere of activities of many organisations and authorities, but such provisions as exist appear to have been made without recognition of the special fire risks of this basic chemical. For instance, in the P.L.A.'s Conditions and Regulations relating to disembarkation of import goods are scheduled a great variety of "Dangerous Goods" (dynamite and other evident explosives), which are not allowed on any P.L.A. property, and of "Hazardous Goods," which are subdivided into four categories intended to correspond with the risk involved.

In this latter section, all nitrates listed (of ammonia, barium, lime, potash, soda), excepting nitrate of strontium, are classed "C." This merely requires that the shipment must be stored or deposited only at places specially approved for it, and seems likely to have been framed with the corrosive characteristics of nitrate chiefly in mind. Strontium nitrate is in the more dangerous category "B," of goods which may pass over the quays but may not be deposited. It is interesting to note in this connection other chemicals of a combustible character which are subject to little discrimination on that account. Potassium chlorate and ammonium perchlorate, for example are ranked with ammonium nitrate as a cargo which can be carried freely through the docks, provided it is not deposited in an unauthorised place. There are a number of other chemicals which some chemists might regard as potentially highly inflammable but for which the P.L.A. do not have special regulations.

France Bans Nitrate Shipments

Reports in Brest, following the disastrous explosion aboard the ammonium nitrate ship the *Ocean Liberty* suggest that the initial outbreak may have been caused by a carelessly discarded cigarette end. The report of the official inquiry is still awaited. Meanwhile, French Government authorities have banned the importation of sea cargoes of nitrate until further notice. Earlier the port authorities at Le Havre moved the 7210-ton United States cargo ship, *Arthur P. Fairfield,* loaded with 10,000 sacks of ammonium nitrate, outside the harbour as a precautionary measure.

Olympia Exhibition

In association with Metal and Plastic Compacts, Ltd., of Birmingham, A. C. Wickman, Ltd., will exhibit high frequency plastic welding equipment at the Engineering and Marine Exhibition, Olympia, from August 28 to September 13. The latter firm will also demonstrate H.F. dielectric heaters for drying and preheating applications, and H.F. induction heaters for brazing and heat treatment of metal parts.

South African Chemical Notes

From our Cape Town Correspondent

THE report on the South African cement industry by the Board of Trade and Industries deserves the attention of the investor, although its recommendation that the import duty on cement be raised is unlikely to have much practical effect, seeing that Europe is unlikely to have an exportable surplus for years to come. In its review of the industry, the Board expresses the view that although technical inefficiency has sometimes left room for improvement, too many producers fail to exercise due caution in selecting their limestone deposits. In 1938 the sales of inland producers were about 15,000,000 bags, compared with a capacity of 16,250,000 bags in 1945. Expansion in the next few years may increase the output by 8,000,000 or even 10,000,000 bags. If consumption increases in the next five years only half as fast as it did from 1934 to 1938, it would reach 20,000,000 bags by 1951. Companies with more than 75 per cent of their shares in South African hands accounted for over 75 per cent of the 1945 output. The balance was produced by firms having 90 per cent of their shares held overseas, *e.g.*, White's and National Portland Cement. The Pretoria group of companies control 60 per cent of the sales and make 70 per cent of the profits in the industry. In the less profitable concerns overseas shareholders predominate. These latter firms sell only 23 per cent of the cement and make only 13.5 per cent of the profits. The report mentions the experiences of a Cape Town firm with the importation of clinker, and refers subsequently to the formation of the Cement Sales, Ltd. as a result of competition between two large producers in the area.

It is interesting to note that while from 1937 to 1939 the cost of South African and imported cement customs, duty apart, was about equal in Cape Town, imported cement was the cheaper in Port Elizabeth and Durban, and the more expensive on the Rand. The report criticises the formation of "secret reserves" by the cement companies, and suggests that the shareholders could have claimed higher dividends from the actual earnings.

* * *

There is a shortage of refined paraffin wax in South Africa, and in consequence candle production at the present time amounts only to about 50 per cent of the 1941 figure. Until June 1946 supplies were imported from India. That source has been closed, however, and only a trickle of paraffin wax from other countries is reaching the Union. "Substitute materials are coming forward in good quantities, and within a few months it is hoped that production will be increased substantially, even though the 1941 peak cannot be reached," says one manufacturer. Countries in a position to aid the Union are refusing supplies of paraffin wax and offering manufactured candles at inflated prices instead. For example, a fairly large consignment of candles from Canada has been distributed in the Union. The wholesale price is 2s. 6d. a dozen, and the retail 2s. 10½d., *i.e.*, about double the controlled price of home-produced candles.

* * *

According to a statement by Mr. F. Crawford in the Northern Rhodesian Legislative Council recently, the Northern Rhodesian Government was anxious to start a factory for the production of cement. A cement plant of 50,000 lb. capacity is said to be available for purchase in Great Britain.

* * *

The chairman of the Transvaal Chemical Manufacturers' Association has said in Johannesburg that sections of the chemical industry are facing a number of difficulties due to the influx of imported goods. "The matter is not so much one of competition in price," he maintained, "for the article produced locally compares favourably with the overseas product in that respect, but the local industry has had to lay off a certain amount of labour, and the ugly face of unemployment is beginning to show itself." He blamed the prejudice of many South Africans against home-produced goods, a tendency that he attributes to the inferior products of certain mushroom manufacturers during the war.

"The vast majority of manufacturers in South Africa today give good solid value for money," he asserted. "Pound for pound the public of the Union gets as good value for its money in local goods as in those from overseas. If the consumers of this country were to give all South African products the support they give to overseas articles there would be an improvement in the finish of South African chemical goods." The only solution, he contended, is nation-wide publicity.

* * *

Mr. S. H. Miller, a businessman from Manchester, recently arrived in Cape Town before proceeding to Port Elizabeth where he investigated the possibility of establishing an industrial oil factory. He said his firm had selected South Africa in which to open a branch of its business because it considered the Union offered better prospects than any other part of the Commonwealth. About £15,000 might be spent on buying a site and erecting a factory.

Vinyl Ethers

Commercial Scale Production

THREE initial compounds in a new series of chemicals, the vinyl ethers, are now in production by Carbide and Carbon Chemicals Corporation at its plant in West Virginia. Vinyl ethyl ether is being produced now in commercial quantities and experimental quantities of vinyl isopropyl ether and vinyl ethylhexyl ether are available. Other vinyl ethers will be produced as the demand for them develops, and a series of vinyl ethers with from one to eight carbon atoms in the alkyl group is anticipated.

The vinyl ethers have already found many applications in Germany and, although new to American industry, are likely to become important chemical compounds there in a relatively short time. They are extremely reactive chemically and offer interesting possibilities both in chemical syntheses and in polymerisation to adhesives and plastic compositions. They can easily be polymerised in either the liquid or vapour phase, with a variety of catalysts. The polyvinyl ethers range from liquids to rubbery solids and waxlike balsams. As adhesives, they have been used in surgical tapes and elastic bandage tapes, where they have been found to be more stable to light and show better storage stability than rubber. They have also been used in pressure-sensitive adhesives for sealing envelopes and paper cartons, in laminating glass, in upholstering, in sealing cellophane and metal foils, and in bonding rubber and other materials to glass.

Copolymers of the vinyl ethers have been prepared with vinyl acetate, acrylic esters, acrylonitrile, styrene, and many other compounds. They have been used as plasticisers and tackifiers for synthetic rubbers and nitrocellulose, and as modifiers for alkyd and polystyrene resins. In synthetic polishing waxes, resin coatings, and lacquers, the vinyl ether polymers impart a lustrous finish to films which may be normally dull in appearance.

Calcium Carbide Production in Italy

Owing to the increased allotments of coal, the output of carbide of calcium in Italy is now regarded as satisfactory. Apart from the carbide produced for the needs of calciocyanamide and ferric acetate industries, 60,000 tons will be available by the end of 1947; 34,400 tons will be produced in north Italian factories and the rest in central and southern Italy.

Ultra-Rapid Plating

Effect of New Chemical Process

New chemicals will make it possible to plate metals from two to eight times faster than ever before, it was reported by Dr. C. E. Adams of the refinery research staff of the Standard Oil Company of Indiana at a technical meeting of scientists of the company held in Edgewater Park, Mississippi.

"These remarkable speeds have been made possible through the use of new sulphonic acids which give not only faster plating but also brighter finishes," Dr. Adams reported. "The new acids have the additional advantage that they can be used over a wide range of operating conditions and are, therefore, more 'fool-proof' than any previous electroplating bath."

Other possible uses for sulphonic acids, which are to be marketed by the Standard Oil Company's new chemical products department, include its use as a catalyst and where a strong acid is needed but where the oxidising characteristics of sulphuric render it unsuitable.

Increased Fertiliser Sales

In the course of his address to the 53rd annual general meeting of Fisons, Ltd., the chairman, Mr. F. G. C. Fison, said that, following the introduction of a more equitable price structure for the fertiliser industry, trading profits had improved and sales had increased. Sales of fertilisers for the 1945-46 season had risen, not only at home, but also in South Africa, Rhodesia and Canada, the total amounting to 1,381,065 tons, compared with 1,283,970 in the previous season. The chairman added that production extensions were making satisfactory progress despite rising costs. Instead of the £3 millions which he had mentioned a year before as necessary to cover capital expenditure over a 3-year period, it had now become evident that a figure of £4 millions must now be substituted.

Colombian Soda Factory

It is announced from Colombia that the Banco de la Republica—which already controls the exploitation of the State-owned salt mines is to finance the installation of a salt refinery and a soda factory near the Zipaquirá salt mines in the Department of Cundinamarca, as well as the draining of the river Neusa to provide water-power for these plants.

Home News Items

Eire Serum Factory.—A new factory for the manufacture of meat protein, serums and various gland extracts is to be started in Clonmel, County Tipperary. The promoters are Chappie (Ireland), Ltd.

Steel Works Plan.—Round Oak Steelworks, of Brierley Hill, Birmingham, is to undergo extensive modernisation, with the effect of increasing the firm's ingot and finished bar production by about 50 per cent.

Scottish Scientific Officer.—According to Sir Steven Bilsland, chairman of the Scottish Council (Development and Industry), a Scottish scientist of note is being invited to accept the post of scientific officer to encourage the use of research by industry in Scotland.

Nuffield Foundation Grants.—The second report of the Nuffield Foundation states that grants totalling £229,430 were allocated during the year ended March 31; altogether the Foundation has distributed £1,182,250 since its inception. Its spheres of interest include the medical, natural and social sciences.

Sequel to Soda Ash Shortage.—Because of the reduction in supplies of soda ash to industry principal producers of house and horticultural glass are making cuts of 50 per cent in deliveries. The cut of 30 per cent of soda ash supplies is seriously curtailing production said an official of a St. Helens glass works last week.

Northern Refineries Projected.—Plans to create a new large-scale oil refinery at Grangemouth will not interfere with the earlier project, supported by American interests, to construct an equivalent refinery on the Clyde, states the Scottish Regional Director of the Board of Trade (Mr. C. A. Oakley). The difficulties in transport to London and to markets in the south of England might, however, prove an obstacle to the Clyde scheme, he considered.

Rubber and U.S. Dollar Exchange

In the course of a statement circulated to United Sua Betong Rubber Estates' shareholders, the chairman, Sir John Hay, comments that natural rubber, which is still the largest of all our exports to the U.S.A., is capable of providing an amount of dollar exchange equal to the total of all U.K. domestic exports, and that that being so, any distortion of the price of rubber in relation to U.S.A. imports, must be a matter of great concern both to Britain and Malaya, especially in the present circumstances.

Technical Literature

Polyethylene Glycol Compounds

CARBIDE and Carbon Chemicals Corporation, a subsidiary of Union Carbide and Carbon Corporation, has just published a new booklet, "Carbowax Compounds and Polyethylene Glycols." This booklet presents the properties, specifications, and uses of a group of polyethylene glycol compounds ranging in molecular weight up to 6000. A number of formulae are given for cosmetic creams and lotions, pharmaceutical ointments, and bases, and various types of maintenance chemicals, such as industrial cleaners and polishes.

Polyethylene glycols have average molecular weights ranging from 200 to 700, and are liquids at room temperatures, those above 1000 in molecular weight being wax-like solids. Their vapour pressure, hygroscopicity, and solubility in water and organic solvents decrease with increasing molecular weight. They dissolve in water to form transparent solutions which do not hydrolyse or deteriorate, are soluble in many organic solvents, including aromatic hydrocarbons, but are only slightly soluble in aliphatic hydrocarbons.

The polyglycols may be used as lubricants for rubber moulds, textile fibres, and metal-forming operations, where they are easily removed with water.

Fatty acid esters of the polyethylene glycols are excellent detergents, emulsifying and dispersing agents, and surface-active compounds, useful in textile processing compositions, insecticidal emulsions, and industrial cleaning and polishing.

* * *

No. 19 or "Rope Talks," the publication in which British Ropes, Ltd., who make ropes of all kinds, picture and describe entertainingly a host of affairs, carries on the tradition of its predecessors. Excellently produced and edited, it supplies an interesting commentary on such subjects as Bailey bridges, industry's part in the Arromanches epic, pilots and diamonds. The part played by ropes is introduced only incidentally.

U.K. Copper Consumption Rises.—Output of copper and copper alloy products during June amounted to 61,646 long tons with a copper content of 49,131 tons. The figure of 330,478 tons for the first six months of the year shows an appreciable advance over the same period of last year, when output totalled 299,933 tons. The copper content figures for the two periods are 260,667 and 230,059 respectively. Virgin copper consumption accounted for 167,893, and copper and alloy scrap 92,774 tons, the comparable 1946 figures being 152,226 and 78,233 tons respectively.

U.S. Fertiliser Exports

The newly formed U.S. Nitrogen Industry Advisory Committee, meeting for the first time, has discussed with officials of the Departments of State, Agriculture and Commerce a programme to expedite U.S. exports of nitrogenous fertiliser materials. World deficiency of such materials is estimated at a million short tons. The United States will import about 187,000 short tons and will produce approximately 686,000 short tons. From this total, the United States is committed to export 57,860 short tons. The nation's export quota goes to specified countries, subject to controls to equalise distribution. Controls are administered by the Office of Materials Distribution of the Department of Commerce with the advice of the Nitrogen Industry Advisory Committee. The use of priorities to assure deliveries to authorised foreign buyers is likely to form part of the scheme.

U.S. Chemists and World Relations

The American Chemical Society—its president, Dr. W. Albert Noyes, Jr., has announced—has appointed a new standing committee on international relations. Prof. Louis P. Hammett of Columbia University is chairman of the committee and other members are: Prof. Chester M. Alter, Boston University; Prof. Floyd T. Tyson, Temple University; Theodore R. Donlan, New York, of the Standard Oil Company of New Jersey; Dr. Foster D. Snell, New York, president of the American Institute of Chemists.

Metal Statistics, 1947 (pp. 816) published by American Metal Market in its 40th annual edition contains a general assortment of statistical information on ferrous and non-ferrous metals, and miscellaneous economic subjects. It records authentic world production and consumption figures and gives prices for which an outstanding event was the ending of government price control in the U.S. on November 10, 1946. The statistics dealing with production and consumption are gathered from various sources and particularly from the American Iron and Steel Institute, American Bureau of Mines, Bureau of Metal Statistics, Civilian Production Administration, Bureau of the Census, Copper Institute, American Zinc Institute, Lead Industries Association, and the Tin Research Institute.

Obituary

The death on July 30 is announced of Professor W. W. Watts, aged 87, Emeritus Professor of Geology at the University of London.

PERSONAL

Mr. H. E. Meade, a director of the Beecham Group, has retired.

Mr. G. J. Austin has joined Wallace and Clark, consulting chemists, Glasgow.

Mr. J. N. Kilby, a consulting metallurgical engineer, has joined the board of the Blaenavon Company.

Mr. B. C. Westall and Mr. J. Eerdmans have resigned from the Scottish Plastics board, to which Mr. C. Milton Marshall has now been elected.

Mr. R. L. Evans, for many years secretary of the Rugby Portland Cement Company, Ltd., has been elected a director. He retains his position as secretary.

Dr. Harold Burton has accepted the Chair of Chemistry at King's College of Household and Social Science, London University, the appointment to take effect from October 1 next. Dr. Burton has been senior lecturer in organic chemistry at Leeds University since 1942.

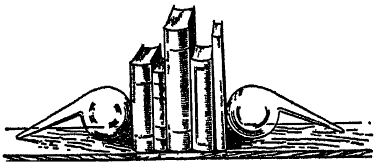
Mr. G. A. Dunbar (managing director, Beecham Export Corporation) and Mr. H. G. Lazell (managing director, McLeans) have been appointed assistant managing directors of the Beecham Group. The managing director, Sir Stanley Holmes, already has the assistance of Mr. B. L. Hobrow.

Messrs. G. R. Marsh and R. Dixon, sales director and technical manager respectively, of A. C. Wickman, Ltd., are leaving for the U.S.A. at the end of this month to renew contacts with American machine tool manufacturers. Together with Mr. R. Ryder, of Thomas Ryder & Sons, Ltd., they will visit the American Machine Tools Exhibition to be held at Chicago from September 17 to 26.

Electron Microscopy Conference

Under the auspices of the Institute of Physics, a conference on electron microscopy will be held at Leeds University on September 16-17. The seventh of its kind, the conference will be concerned with the applications of the electron microscope rather than its construction.

Among eminent speakers scheduled to address the meeting are Dr. R. Reed and Dr. K. M. Rudall (Leeds University), Dr. E. Brieger, Dr. V. E. Cosslett, Dr. G. R. Crowe and Dr. C. F. Robinow (Cambridge), Dr. F. M. L. Sheffield (Rothamsted Experimental Station), Dr. A. E. J. Vickers (I.C.I., Billingham), and Mr. R. Page (Metropolitan-Vickers). Short contributions are invited for the 2.15-4.30 p.m. period on Tuesday, September 16. Applications for accommodation should be addressed to Dr. R. Reed, department of Biomolecular Structure, Leeds.



A CHEMIST'S BOOKSHELF

British Catalogue of Plastics. By E. Molloy. National Trade Press. 50s.

THIS catalogue is a comprehensive guide to the selection and use of plastics by the fabricator. Undoubtedly it will be a useful book in some respects but it has fallen below our expectations.

There are several articles on the various materials which are available but many of them have been given scant attention. The section entitled "Vinyls" should have been given far greater scope in view of the consumption of PVC and its co-polymers in industry. In connection with PVC a statement is made that PVC compositions are not soluble in common organic solvents. This is not strictly true as some of the Geon resins have a useful solubility range at various temperatures in methyl ethyl ketone.

PVC latex is undoubtedly a material which will be used to a great extent in the near future especially in the spreading industry, but this subject does not appear to have been dealt with in the encyclopædia. A further point regarding PVC is that Hycar O.R.-15 and Hycar O.R.-25 are compatible in all proportions with some PVC polymers and co-polymers. This property is of importance as the thermosetting properties of such mixtures make them suitable for higher temperatures than are normally possible with the thermoplastics. A further advantage of using the Hycars as plasticisers is that they are oil resistant. At the present time much work is taking place on the question of blending unvulcanised Hycar with PVC stocks.

In the section on Cellulose Acetate Plastics, no mention is made of the value of the methylene chloride method of manufacturing cellulose acetate.

Other points which should have been mentioned are the advances made in acetylene chemistry in recent years by Dr. Reppe of the I.G., and the possibility of hot gas welding of thermoplastics. High frequency welding is well illustrated but for some purposes is most unsuitable, *e.g.*, for lining chemical plant with unplasticised PVC and for this it is necessary to use the hot gas welding method. This field is at present in its infancy in the United Kingdom, possibly because PVC is being used so much for household goods, whereas in the future, when the present market has been satisfied, it will be used on a far greater scale for industrial purposes, for chemical resistant plant, etc.

It is possible that the announcement on Terylene and its discovery was not made until proofs had been completed for this volume and possibly some mention will be made of it next year in the section on synthetic fibres.

A further addition which the next edition should have is a complete section on the machining of plastics and full details of the tolerance on dimensional stability that can be expected with the various types of moulding powders for different thicknesses.

During the recent war, considerable attention was given to the weathering characteristics of plastics, but in this country the subject has been largely forgotten since V.J. Day, whereas in the U.S.A. much attention is still being given to this subject, especially as far as the application of plastics for extremes of climate is concerned.

Two sections which are of great value and will serve a need in the industry are entitled "Schedule of Chemicals and Raw Materials for Plastics Manufacture" and "Schedule of British Raw Plastics and Intermediate Materials." Data is given in both these sections for many products.

An extremely interesting section is that devoted to the automatic control of temperature, pressure and time in plastics mouldings. Many manufacturers are against the capital cost involved in such automatic controls. But a moulder who instals such equipment need have a minimum reliance on his labour. Fuel costs are also reduced to a minimum and the number of rejects falls with such control.

The British Catalogue of Plastics will fulfil a function in British industry, but I look forward to seeing the next edition which will undoubtedly rectify many of the failings of the present edition. Perhaps next time we will see in the Table of Contents details of the authorship, as without this we have to go through each section to find who has written any particular contribution.

Lansil's Indian Project

In the course of his annual statement, Sir Donald Horsfall, chairman of Lansil, Ltd., states that the company has concluded arrangements during the year to supervise the construction of a cellulose acetate plant at Hyderabad, India. In consideration of these services, the company would participate in the earnings of the Indian company.

Overseas News Items

U.S. Oil for Russia.—The U.S. Department of Commerce has granted an export licence for shipment of 248,000 tons of oil to Russia.

New Chlorine Plant for Canada.—The Dominion Alkali and Chemical Company of Beauharnois, Quebec, Canada, is planning to set up a new chlorine and caustic soda plant in the Dominion this autumn. Actual production is, however, not expected before 1949.

Rare Radio-active Substance.—A French metallurgist is understood to be making plans to carry out a search in the Yellowknife area of the North-West Territories, Canada, where he hopes to find deposits of a rare substance containing radio-active elements.

Belgians Plan Underground Gasification.—A syndicate of Belgian mine owners which has been studying U.S. methods of underground gasification of coal in the Alabama mines is planning a wide-scale adoption of the system in Belgium, where there are computed to be 1000 mines abandoned because of the higher cost of bringing the remaining coal to the surface.

Italy Still Short of Soda.—In spite of recent progress, output of soda in Italy has not yet caught up with the country's requirements. This is due to the fact that various industries consuming soda have been increasing their production. The output of electrolytically produced liquid soda is reasonably good, but the output of caustic soda lags behind, owing to the shortage of coal and the inactivity of the Monfalcone factory.

German Soap and Plastics Production.—The Rheinpreussen chemical works at Homberg will soon begin production of raw materials needed for the soap industry in Western Germany. One-third of the plant's capacity will be used for this. The former I.G. Farben establishment at Krefeld is to manufacture raw materials for the same purpose at Urdingen, where methanol for the plastics and pharmaceutical industry will also be produced.

U.S. Controls.—There is little likelihood that United States production of copper, lead and zinc will be sufficient to remove controls before June 30, 1948. Nitrogenous fertilisers probably will be controlled up to and including June 30, 1948. It may be possible to decontrol potassium fertilisers after the second quarter of 1948 and to decontrol phosphate considerably earlier. Export controls on industrial chemicals must be continued until the Atomic Energy Commission is organised to license the export of fissionable materials.

Austria's Coal Import Plans.—Austria, it is reported, will receive 110,000 tons of Ruhr coal from Germany, 80,000 tons from Poland, and 30,000 tons from the U.S.A.

New Iron Ore Discoveries.—Extensive deposits of iron ore within convenient freight distance of Western smelters were discovered in Iron County, Utah, during the wartime search for domestic metals and minerals conducted by the Bureau of Mines.

Plastic Shields for U.S. Navy.—The U.S. Navy is experimenting with a transparent plastic cover, designed to protect the men on a warship's bridge from weather, gun blasts and fumes. The U.S.S. *Manchester* has been fitted with one of the first models, consisting of plastic panels in a metal framework, mounted over the forward section of the open bridge.

Salt Discovery in Bulgaria.—An egg-shaped deposit of salt, which it is estimated will supply Bulgaria with salt for 4000 years, has been discovered 50 feet beneath the ground near Provadia, in Northern Bulgaria. The deposit is estimated to be about five and a half miles long, two and a quarter miles wide and 1090 yards deep. Experts believe that petroleum may also be found in the region, which is close to the oil-bearing region in Rumania.

U.S. Investments Overseas.—American direct investments overseas—in branches of American companies and foreign enterprises in which Americans hold 25 per cent of the voting stock—earned $520 millions in 1946, the largest total ever recorded. Direct investments abroad were worth $8100 million, 14 per cent more than in 1937. Largest dividends were: from Latin-America ($273 million), Canada ($126 million) and Europe ($48 million).

Japanese Traffic in Opium.—" One of the most flagrant violations by the Japanese Government of national drug laws and international treaties " is revealed by the U.S.A. Department of State and referred to in the 1946 report of the Permanent Central Opium Board, now operating under U.N.O. According to American authorities in Japan, in one small factory in Korea, operated by the Japanese Government in 1938, 2742 lb. of heroin were manufactured, and, in 1939, 2925 lb., of which during these two years 5291 lb. were consigned to the Manchukuo Monopoly Bureau. It is pointed out that the annual requirements of heroin for China, including Manchuria, were only 37 lb., and the total world medical needs were not more than 3600 lb. per annum.

Parliamentary Topics

Home Production of Carbon Black ?

British Carbon Black—" Confidential."— "I cannot answer this question without disclosing information of a confidential nature regarding processes which are being considered for the production of carbon black in this country," said the Parliamentary Secretary of the Board of Trade (MR. J. W. BELCHER) in the course of a reply to a series of questions on carbon black supplies. Mr. J. Lewis had asked what raw materials were available in this country for the production of charcoal, or other black which would be acceptable to tyre manufacturers. He had asked earlier whether U.S.A. producers were altering processes of production of furnace black for the U.K. because of the British customs regulation requiring an all-gas certificate to qualify the import for the lower rate of duty. The addition of liquid hydrocarbons, he believed, was therefore being discontinued. He asked that the distinction in import duties should be eliminated.

Government Shares in Anglo-Iranian.— The total value of shares in the Anglo-Iranian Oil Company owned by the nation has risen since January 1 by about £49 million at present market prices.—MR. H. DALTON (Chancellor of the Exchequer)

Another Linseed Substitute?—Asked what steps were being taken to put to commercial uses seeds of the rubber tree, the Secretary for the Colonies (MR CREECH JONES) said: So far as I am aware there is no commercial use at present. I am aware that rubber seed oil is a drying oil suitable for use as a substitute for linseed oil, but there are great difficulties in the way of seed collections since there is usually a dense high ground cover on rubber estates. The seed also must be collected fresh and then rapidly dried before it is exported. It is being suggested that a trial consignment of Malayan seed dried on a copra kiln during the forthcoming seed season be shipped here for trial.

Linseed Oil Production.—Mr. Creech Jones (Colonial Secretary) announced last week that he was aware of the need for increasing the production of drying oils in the Colonial Empire, and that he was, in fact, already in communication with the Governments of such territories where the climate might be expected to allow the cultivation of linseed. As a result, a 4000 acre project is to be put in hand in Kenya this year. With regard to linseed substitutes, tung oil is already widely cultivated in Nyasaland. Whether or not large-scale development will follow depends upon the results of the trials.

Magnesia Refractory Materials

IN a recent French patent for an improved process for the manufacture of refractory materials containing magnesia, the Soc. de Recherches et d'Entreprises Indust. and Chim. of Paris, uses sea magnesia of fairly high purity which is roasted in a reducing atmosphere at a lower temperature (1300-1500° C.) than is commonly employed.

The object of the present invention is to start with sea-water magnesia, i.e. the oxide or hydroxide, which can be roasted in a reducing atmosphere, without addition of impurities, at a temperature below 1600° C. By way of example, nearly pure sea magnesia containing 96 per cent MgO, 0.6 per cent SiO_2, 0.13 per cent Al_2O_3, 0.35 per cent Fe_2O_3, 2.55 per cent CaO, 0.6 per cent sulphates, and traces of chloride, is baked for three hours at only 1300° C. in a reducing atmosphere in an induction oven with graphite lining. A good quality product is obtained with maximum density; and if roasted further for another three hours at 1400° C., still better results are obtained. (Corresponding English patent application is 30975/1946).

Dwindling Oil Output

A further decline in Rumanian petroleum production this year is foreshadowed by reports just published in the country. Estimates for the current year anticipate a mere 3,500,000 tons of crude oil output, and the dire lack of equipment makes a further decline to the three million mark a foregone conclusion. Of an order for 6000 tons of materials placed with Czechoslovak manufacturers last year, only some 1500 tons were so far delivered, compared with annual pre-war imports of drilling equipment (from all sources) of 30,000 to 40,000 tons. The country's reserves have been estimated by the director of the Geological Institute at approximately 100,000,000 tons. A revival of the once flourishing Rumanian petroleum industry is out of question without a thorough programme of re-equipment and intensified drilling, both in hitherto untapped areas and in the established fields.

A resolution urging the development of Canadian mineral deposits with a view to attaining self-sufficiency in chemical fertilisers has received the general approval of the Canadian Senate. The motion, tabled by Senator J. A. McDonald (Lib., Nova Scotia) called attention to recent discoveries of high-grade phosphate rock in the Saguenay district of Quebec Province and of good quality potash in Saskatchewan.

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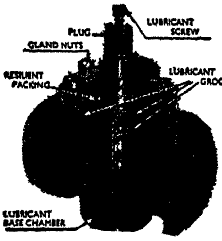

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COMPANY MEETING

Beecham Group

THE 19th ordinary general meeting of Beecham Group, Ltd., was held on July 30 in London, Sir J. Stanley Holmes, M.P. (chairman and managing director), presiding.

The following is an extract from his circulated speech:

The trading profits and sundry revenue for the year ended March 31, 1947, earned by the companies and branches of the Beecham Group, operating in nearly every part of the world, amounted to £2,682,216 compared with £2,786,705 in the previous year. The set-back was largely accounted for by the loss of profits on home trade directly attributable to the fuel crisis in the early part of the year, which it was estimated amounted to approximately £150,000, due to enforced cessation of production and the payment of wages of staff temporarily unable to be employed. The profit on export and overseas trade, which is included in the above figures, was £644,745 compared with £543,580 for the previous year.

Increased Home Sales

The home sales of the company's subsidiary companies showed an increase of 8.33 per cent over those of the previous year. The basis of the business has been continually broadened. The sales of pharmaceutical products, which comprise 32 per cent of toilets and foodstuffs showed a gratifying expansion.

For the year under review over £378,000 has been spent in capital improvements and there are also commitments outstanding for future capital expenditure amounting to some £270,000 for the company and its subsidiaries. The directors felt that the time had come when permanent funding of the company's indebtedness to its bankers should take place, and accordingly they approached H.M. Treasury for permission to issue the major portion of the deferred shares remaining unissued. I am glad to say that we have received permission from H.M. Treasury to make such an issue, and deferred shareholders, to whom the issue will be confined, will in due course be notified of its terms.

The net amount available for dividend on the deferred shares and for reserve, after paying all charges, including preference dividends and taxation, was £504,409, as against £386,326 in 1946. The directors have already paid interim dividends of 36 per cent. The result will be that, of the balance of profits of £504,409, £332,750 will have been distributed to the deferred shareholders and £171,659 will be added to the carry forward.

Company News

Anglo-Iranian Oil Co., Ltd., announces a net profit of £9,624,938 for the year just ended, and a final dividend of 25 per cent (making 30 per cent for the year) is recommended.

C. C. Wakefield and Co. announce that profits for the 1946 period amount to £1,149,849 representing an increase of £436,738 over 1945. A final dividend of 75 per cent together with a cash bonus of 35 per cent is recommended.

Johnson & Sons, manufacturing chemists have announced a profit of £43,318 for 1946 as against £40,328 for the previous year. An interim dividend of 6 per cent has been paid on the ordinary shares.

Lansil Ltd., has reported a gross profit for the year just ended of £172,938, and dividends of 8.39 per cent and 15 per cent (both less tax) on the ordinary stock and deferred stock respectively, are recommended.

Mazapil Copper reports that a dividend of 15 per cent, less tax, will be paid on the £600,000 ordinary share capital for 1946. Dividends of previous years have been: 1945, 10 per cent; 1944, 7½ per cent, and 1943, 2½ per cent.

The nominal capital of **Collvita, Ltd.,** manufacturing chemists, Hawkeshead, Old Glossop, Derby, has been increased by £3000, in £1 ordinary shares, beyond the registered capital of £500.

New Companies Registered

Gordon E. Rose, Ltd. (438,973). Private company. Capital £100 in 1s. shares. To carry on the business of inventors, research engineers, chemists, etc. Subscribers: John E. G. Curthrop and Chas. H. Rickitt.

Universal Chemical Industries (London) Ltd. (439,102). Private company. Capital £1000 in £1 shares. To acquire the business of chemists now carried on by the Universal Chemical Co. Directors: Harold G. Brass; Arthur J. Penfold; Wm. I. Morgan; Alfred J. Reece and Sidney Randall. Registered office: 341a Ladbroke Grove, W.10.

Catalytic Co. of Great Britain, Ltd. (438,777). Private company. Registered July 12. Capital £500 in £1 shares. To carry on at Croydon and elsewhere agencies for the import, export, purchase and sale of catalyst goods; to manufacture and deal in catalysts, chemicals, gases, acids, compositions, electrical and chemical equipment, apparatus and other materials, etc. Directors: Robert F. Reed and David Bowman. Registered office: 128-130 Oval Road, Croydon.

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Chemical and Allied Stocks and Shares

As was to be expected, stock markets moved very closely with British Funds and have recorded a general fall in values, although there has been a modest recovery from lowest levels which were reached in most sections towards the end of last week when 2½ per cent Consols were down to 82. Irredeemable gilt-edged stocks are now virtually on a 3 per cent yield basis and it is assumed in the City that official support for the market would be forthcoming to hold this level. The Government's crisis measures are the dominating factor at the moment, but following the indescriminate marking down of values which was in progress last week, buyers were in evidence, because in some instances industrial shares now seem relatively undervalued. The assumption is that many companies engaged in essential industries and playing a big part in export trade offer reasonable prospects of at least maintaining dividend payments, granted of course that the crisis is held in check and there is no repetition of widespread fuel shortage on the lines experienced earlier this year.

Imperial Chemical were down to 43s. at one time but attention was drawn to the good yield and to the fact that this was the lowest level since the distribution for the past year was raised from 8 per cent to 10 per cent. The price quickly rallied to 46s., but later eased to 44s. 6d. Fison's were down to 58s. 9d. B. Laporte marked 94s. 3d. at one time, Burt Boulton 26s. 3d., Monsanto Chemicals were 55s., and Morgan Crucible changed hands around 58s. 6d. Greeff Chemicals Holdings 5s. shares were dealt in around 16s.

British Glues & Chemicals were 19s. 3d., and elsewhere Dunlop Rubber at 70s. 9d., and De La Rue at 53s. 9d. were above recent lowest levels, while United Molasses at 51s. 9d. also showed a moderate rally, as did Turner & Newall at 78s. 9d., and the units of the Distillers Co. at 140s. 6d. also attracted some attention on hopes that the pending final dividend payment may be 5 per cent. General Refractories were 22s., and Goodlass Wall at 36s. 9d. moved above their reccent lowest. Pinchin Johnson were 61s 9d., and International Paint £7¼. Associated Cement have lost ground at 69s. 4½d. and British Plaster Board were 27s. 3d., while Metal Box shares changed hands around £5. Lever & Unilever were down to 49s. 4½d. Wall Paper deferred receded to 48s., but there was a better tendency in textiles after earlier falls, hopes being centred on export trade prospects. Courtaulds after falling heavily to 45s. 3d. have rallied to 46s. 6d. at the time of writing.

There has been a good deal of movement in the iron and steel section, partly because of alternating hopes and fears as to whether the Government is likely to bring forward nationalisation plans in view of the economic crisis. United Steel, Dorman Long and other leaders in this section were lower on balance, but there was some recovery from recent lowest levels, it being pointed out that if nationalisation were abandoned, the good yields offered by iron and steel shares would be bound to attract widespread attention; while if after all nationalisation were brought forward, fair compensation for shareholders would justify prices well above current market levels.

In other directions, Boots Drug at 59s. were above recent lowest levels, Beechams deferred also strengthened a little to 25s. British Aluminium were 4s., British Oxygen 96s. 3d., and Murex 92s. 6d. Oil shares have fluctuated sharply and were lower on balance. Before sentiment came under the influence of fears of reduced oil imports earlier in the week, Anglo-Iranian after being down to close on £9, had rebounded to £10.

Market Reports

With the shorter week and the annual holiday stoppage in a number of consuming industries, the general movement of chemicals against delivery specifications has been somewhat restricted. At the same time, there is a ready market for any spot parcels which may be offered and inquiries for new business, both for home and export account, are no less in volume. There is no doubt that a better container position would enable the chemical industry, particularly the tar products section, to show even better export returns than those published for June.

MANCHESTER.—An unmistakable effect on activity in the Manchester market for chemicals and allied products during the past week has been exercised by holidays in textile and other using works in Lancashire and the West Riding of Yorkshire. Fresh bookings for home use as well as on export account have been less in evidence and there has also been a more restricted movement of supplies of the alkalies and other leading heavy chemicals against orders already on the books of makers. Next week, however, should see a return to something like normal conditions, though the shortage in several sections is likely to cause a good deal of inconvenience at the using end of the trade.

GLASGOW.—Business has again been quiet in the Scottish chemical trade during the past week. Inquiries from overseas have been firmer and they cover the whole range of chemicals, particularly noteworthy in the demand from overseas has been potassium nitrate. It is expected that business will be returning to normal next week when the trade holidays are over.

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Technical Reports

THE total number of German and Japanese Industrial Reports now available is 2297 (2200 German and 97 Japanese).

Reports on Japanese industry so far received are almost exclusively from American sources and are in most cases compiled by teams of United States Service Personnel, and readers are reminded that many of these reports are of a preliminary nature and do not go into great detail.

To avoid infringing patent rights firms interested in exploiting any particular item are advised to investigate the patents position in the United Kingdom before going into production. Similar investigations are also desirable before exports are made to any particular country abroad.

CIOS XXXIII—42. Hydrogen peroxide production at Hollriegelskreuth. Part 1. General notes and potassium persulphate process (7s.).

CIOS XXXIII—44. Direct synthesis of hydrogen peroxide by electric discharge (6s. 6d.).

BIOS 1060. German acetylene chemical industry, butadiene (6s.).

BIOS 1091. Rock drilling bits tungsten carbide tipped (1s. 6d.).

BIOS 1283. The welding of polyvinyl chloride, summary of German practice (2s.).

BIOS 1292. German acetylene chemical industry, methyl vinyl ether (1s. 6d.).

FIAT 749. Regular intergrowth of synthetic phlogopite with hydrous mica (3s.).

FIAT 1019. Magnesium carbide and methylacetylene (1s.).

FIAT 1047.—The manufacture of inorganic mercury salts from prime virgin mercury at Chemische Fabrik Marktredwitz, A.G. (1s.).

FIAT 910. Production of pharmaceutical and industrial enzymes in Southern Germany (4s.).

FIAT 969. Acetylene generation. Dry method (4s.).

FIAT 994. The purification of sulphur with oleum (1s.).

BIOS MISC. 1. The German plastics industry (32s. 6d.).

BIOS/JAP/PR/861. Report on the magnesium industry of Japan (1s.).

BIOS/JAP/PR/900. The copper industry of Japan (3s. 6d.).

BIOS/JAP/PR/1159. Dolomite resources in Japan (2s.).

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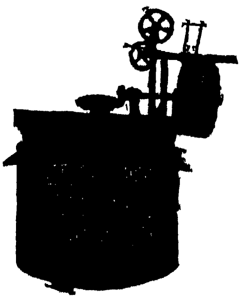
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A Crisis in British History

" She left the web, she left the loom,
She made three paces through the room,
She saw the water-lily bloom,
She saw the helmet and the plume,
She look'd down to Camelot.
Out flew the web and floated wide;
The mirror cracked from side to side;
' The curse is come upon me,' cried
The Lady of Shalott."

TENNYSON has lately come back into fashion and there must be many of our readers who remember the sad fate of the Lady of Shalott. Shut in her room, she watched through a mirror the procession of knights and commoners, of country-folk and boatmen, the whole pagentry of life, pass her window. She took no part in life, her's was a purely theoretical interest with which she could sit at the ringside, as it were, to criticise and comment. One day temptation to take a hand in the practical affairs of life proved too strong; she looked through her window down to the great city; she adventured into the stream of life; and disaster followed.

There is a great deal in the story of the Lady of Shalott that matches the events of the last two years. Blessed by strong leadership and faith in our cause, aided later in the struggle by the most powerful nations of the world, we came through the second great war in our history militarily victorious. We sat on the top of the world. The war, however, bequeathed great problems that needed for their solution great leadership. Unfortunately it was at this moment that the nation decided to place its destinies into the hands of the modern ladies of Shalott, theoretical critics of world politics without practical experience of the handling of affairs. Energies that should from the start have been devoted to securing national unity, to making ready for the economic crisis that everyone with any knowledge of affairs must have foreseen, were expended upon putting into action socialist theories. More than half the voters of the country expressed themselves against such a policy, but, once in power, the Government made haste to put their theories into practical effect as fast as they could. Parliament was overworked, the Civil Service was overworked, everyone who could contribute useful ideas was overworked so that there was no time to think—and all this effort was to deal with measures which could not contribute in the smallest degree towards our economic rehabilitation. Instead of unity there has been veiled class warfare. Instead of skilled planning there has been nationalisation, which is nothing more than a change of ownership in certain industries. Private enterprise has been stifled. Government control has cast its dead hand upon everyone. Now the curse has come upon us.

Unlike the Lady of Shalott we cannot lie down and die. We propose to live. It is the duty of the Government of the day to devise measures to meet the national crisis that has resulted as the after-effects of expending our treasure in the defence of mankind against a mighty despotism. In 1946 we had an adverse balance of £400 million; by the first half of this year that had risen to the annual rate of over £700 million. That balance was foreseen and the American loan—which we shall presently have to repay—was negotiated to give us a breathing space (that space which has been wasted in putting socialist theories into effect), but due to world rise

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in prices, the loan will be exhausted long before the estimated period. We appear to have about six months to put our house in order and to find means either by cutting imports or by increasing exports (in practice by both) to convert the £700,000,000 deficit into a balanced budget, or a profit. Had we started to do this two years ago we might have got a long way towards achieving our objective; at least it might have been in sight. There is a great deal of sound common-sense in the criticism that whatever is done now would have been better if it had been done when the Government first came into power.

This is not a time to spend our energies in apportioning blame except insofar as the apportionment of blame enables us to see what to avoid in the future. The Government has set forth the heads of a plan, but has put before the nation no plan. They have told us what must be done in the way of increased production, decreased expenditure and so forth, but have given nothing more than the heads of a policy, admitting that the details have still to be worked out. Production for export is a case in point. We are bidden to increase exports by 160 per cent of the 1938 figure by the end of 1948. If it is a matter only of producing the goods and sending them overseas, no doubt it can be done; we can do that by working harder, increasing the machinery at our disposal to increase production per man-hour, and foregoing goods ourselves in order to send them abroad. If this were all that is necessary we would cheerfully reduce our standard of living to balance our budget; we would change our name from John Bull to John Spartan Bull. But is there any justification for the view that the world will buy that amount of goods from us? Many other countries will by December, 1948 be in the same boat as ourselves. One of the measures proposed is that we should buy less from abroad. Will not every other nation that gets into financial difficulties take exactly that same view? Are the goods that we can produce under austerity conditions likely to meet with approval abroad? If so, why do foreign nations all seek for dollars which they can spend in the U.S.A. rather than for sterling which we would accept for our goods?

The basis of our production is coal. The miners have been given everything they asked for; no doubt some other workers will have taken note of their technique. The result is that already the Government and the unions and the Coal Board have confessed by implication that all the smoothly optimistic estimates that as much or more coal would be got in five days as in six have been proved wrong by practical test. Coal has been mishandled to at least as great an extent as our other affairs. Shall we even now get enough coal for next winter's cold weather and to permit maximum production? The talk is rather of rationing coal and power to industry to keep only the essential firms in production.

The insistence on increased agricultural production is admirable. The chemical industry will have a part to play here in the provision of artificial feeding stuffs and

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NOTES AND COMMENTS

Voice in the Wilderness

BECAUSE the onlooker sees most of the game there seem to be good grounds for according more respectful attention than the average after dinner speech deserves to the apparently prophetical observations made by the principal guest of the Society of Chemical Industry at its recent dinner in London, the Master of Balliol. Lord Lindsay of Birker would no doubt disclaim the rôle of prophet as emphatically as he rejected any pretension to be regarded as a scientist; but when conjecture about the probable course of future events has logic on its side no claim to clairvoyance is involved. As an unscientific onlooker, trained, however, to estimate with more than common acumen probable trends in human affairs, the Master of Balliol has said in effect that chemists and constructive scientists at large cannot any longer logically evade responsibility for the application of results of contemporary work in the laboratories. Latterly, chemists and physicists have dispensed powers for good or evil greater even than the dictators have wielded; and of the effects of power divorced from responsibility the world has recently had some fearful illustrations. In pre-war Germany a group of powerful industrialists were doing something of the same kind, without such altruistic motives and on an infinitely smaller scale. Hitler and carnage were the result. To-day, as the Master of Balliol pointed out, chemists "could, if they put their minds to it, produce even filthier things than the atom bomb." His fear is that in the fever of some fresh nationalistic convulsion they may be coerced into doing just that, and, recollecting some of the ghastly evidence of perverted science revealed by the Nazi war trials, his fear cannot be lightly dismissed. In the recent evidence provided in London of the readiness to collaborate for scientific ends on the part of free scientists of most nations the Master of Balliol sees the seeds of an international brotherhood of enlightened men against whose concerted will even our terrestrial powers of darkness could not prevail. The readiness of most foreign scientists to promote that end is evident. If they were given the leadership of British and American scientists Lord Lindsay's would not be a voice crying in the wilderness.

Trade Union Policy

"RESTRICTIVE practices" is a term with which Government speakers have made us tolerably familiar of late. Its meaning, unless specifically qualified, is generally a capitalist conspiracy to maintain prices. Latterly events have repeatedly conspired to present the term in another context, of which a flagrant but not isolated example is that of Mr. Thomas Poole, a welder in the Austin Motor Company's Longbridge Works—who doubtless has a much more pungent word for the predicament in which he was placed by his trade union. The Birmingham and Midlands Sheet Metal Workers' Society, through its shop stewards committee, it is reported, has "fined" him 18s.: the bonus due to him for having welded more motor wings than the quota fixed by his union permitted. There were, it seems, extenuating circumstances in that Poole's transgression was committeed to ease a production difficulty on the eve of the Easter holiday. But, like the laws of the Medes and Persians, this trade union's regulations apparently take no heed of special circumstances; and Mr. Poole has aggravated his offence by saying he regarded the 18s. as "money he had earned and was entitled to keep." The president of the Metal Workers' Society simply observes that the fixing of a target figure in consultation with factory managements "improves production by giving workers an incentive to reach that output." Mr. Poole, it is evident, was guilty of an immoderate response and overreached it, and for that he was, it is reported, suspended from his union's sickness and unemployment benefit. (The union has since denied that he is to be suspended.) We have recounted this simple and presumably routine occurrence in the hope that someone will point out an extenuating factor showing that this and similar policy need not make nonsense of the current industrial programme. The union's explanation—that this welder had refused to let another man share the work he could do very well by himself—serves only to make the situation the more grotesque.

The Long View

FEW more revealing indications of the Government's capacity for taking the long view of fundamental needs of industry, in addition to the present publicised shortages of coal, steel and labour, are likely to be found than its ultimate response to the two explicit warnings it has lately received from experts on the need for great expansion of the country's training facilities —academic and technological. It is essentially the concern of the Government, although the Ministries of Education and Works are the immediate authorities, because large provision of national resources of cash and building labour and materials are involved. If these are not provided in ample quantities all talk of raising the total of the country's qualified scientists to 90,000 by 1955—the minimum mentioned by the Barlow Committee—must be regarded as wishful thinking. The latest reminder has come from an authoritative deputation from the Parliamentary and Scientific Committee (including Dr. A. V. Hill, Professors Alexander Findlay, E. N. da C. Andrade, F. G. Garner and Mr. C. S. Garland), who last week told the Minister of Works that the highest building priorities as well as financial support must be gives at once if the universities were to double their output, as they must do, in the next few years. Such a building programme may cost £100 million and should be worth every penny of it, particularly, as the deputation pointed out, in the light of present economic difficulties. It remains now to be seen whether the Minister's assurance that his Ministry and the Government will co-operate fully in this urgent project is fulfilled by Government policy and whether an equally far-sighted programme is applied to the senior technical colleges, the subject of an expert report summarised in this issue. The debt which all our industries already owe to research scientists and to the technologists can never be expressed in adequate terms; given the scope and facilities, their contribution to our future economy will be worth more than a dozen dollar loans, without being expendible. No Government which fails to recognise that can hope to lead a permanent rehabilitation of our national fortunes.

A CRISIS IN BRITISH INDUSTRY

(*Continued from page* 212)

fertilisers. Can the land permanently produce 20 per cent more than our best war-time efforts drew from it? Will that rate of production cause loss of fertility? Those are questions that remain to be answered; there is no evidence that any answer has been provided. Will the necessary additional 100,000 land workers be available? Land workers, colliery workers, engineering workers all require training; it is little use "directing" men and women into industries in which they are not skilled, except to do routine mass-production work. British goods will not sell throughout the world on the basis of mass-production; the world wants skilled craftsmanship from us.

But, as if to emphasise the complete lack of any thought-out plan, the Government through its new "Supplies and Services" Bill has taken the widest, dictatorial powers over the lives of every individual in the country. Yet at the same time, the Government spokesman has stated that although asking for these enormous, frightening, powers, they had no idea at all how they would be used. Even that great Labour organ, *The Times*, has been constrained to comment that while no one will suspect the Government of attempting to carry out a social revolution under the guise of emergency measures for defence, "the powers nevertheless, are totalitarian" and there should be a clear definition of the reason why they are wanted. As it is, they give to the Government "the almost unlimited conscription of persons and property." One of the alleged purposes of these powers is "generally for ensuring that the whole resources of the community are available for use, and are used, in a manner best calculated to serve the interests of the community." It is difficult to find any political or economic project which could not be brought under this clause, including temporary or permanent confiscation of businesses on the pretext that they are inefficiently managed. The measures taken to meet the present crisis are insufficient, theoretical, hazy, and the powers that accompany them are so wide as to prompt the fear that our last state may be worse than our first unless there are among our rulers those who possess altogether unsuspected sagacity in the management of business affairs.

Sulphuric Acid Statistics

Increased Use in April-June

PRODUCTION and use of sulphuric acid and oleum in the U.K. in the second quarter of this year are the subject of a summary just issued by the National Sulphuric Acid Association, Ltd., which shows a fairly substantial rise in the use of acid, but no marked increase in production. The only significant improvement in production was in contact-produced acid; which totalled 176,295 tons of 100 per cent H_2SO_4, against 149,779 tons in the January-March quarter. Total use accounted for 355,423 tons, compared with 320,897 tons in the first quarter.

SULPHURIC ACID AND OLEUM

	Chamber only	Contact only	Chamber and Contact
	Tons of 100 per cent H_2SO_4		
Stock April 1, 1947	39,713	33,036	72,749
Production ...	170,710	176,295	347,005
Receipts	36,545	35,303	71.848
Oleum feed ...	—	2,514	2,514
Adjustments ...	−45	+153	+108
Use	104,505	71,382	175,887
Despatches... ...	106,202	143,827	250,029
Stock June 30, 1947	36,216	32,092	68,308
Total capacity represented	221,890	205,700	427,590
Percentage production	76.9%	85.7%	81.2%

RAW MATERIALS

	Pyrites tons	Spent Oxide tons	Sulphur & H_2S tons	Zinc Concentrates tons
Stock April 1, 1947	73,639	148,660	54,393	33,819
Receipts	82,162	53,861	54,134	30 850
Adjustments ...	+162	+475	−254	—
Use	71,291	44,307	55,581	44,094
Despatches... ...	374	3,746	129	9
Stock June 30, 1947	84,285	149,812	52,563	20,566

SULPHURIC ACID AND OLEUM CONSUMPTION

	Tons 100 per cent H_2SO_4
Accumulators	2,165
Agricultural purposes	702
Bichromate and chromic acid	1,783
Borax and boracic acid	
Bromine	2,674
Chlorsulphonic acid	
Clays (Fuller's earth, etc.)	1,478
Copper pickling	640
Dealers	4,283
Drugs and fine chemicals	2,077
Dyestuffs and intermediates	15,670
Explosives	3,285
Export	1,358
Formic acid	
Glue, gelatine and size	100
Hydrochloric acid	13,718
Hydrofluoric acid	955
Iron Pickling (including tin plate)	20,390
Leather	1,208
Metal extraction	321
Oil (mineral) refining	8,709
Oil (vegetable) refining	1,660
Oxalic, tartaric and citric acids	2,078
Paint and lithopone	12,957
Paper, etc.	767
Phosphates (industrial)	1,165
Plastics, not otherwise classified	4,396
Rare earths	2,211
Rayon and transparent paper	32,779
Sewage	2,531
Soap and glycerine	684
Sugar refining	135
Sulphate of ammonia	50,163
Sulphate of barium	821
Sulphate of copper	4,281
Sulphate of magnesium	2,436
Sulphate of zinc	572
Superphosphates	119,778
Tar and benzol	3,864
Textile uses	4,970
Sulphate of alumina (and other uses) :	
Unclassified Uses	18,742
Uses unknown	6,967
Total	355.423

Chemical Output Rising

1500 More Employed in May

THE number of people employed in making chemical and allied products in May this year was larger than at any time since the war, when, including workers engaged on explosives, the industry employed 438,100. The corresponding figure for May for chemicals, explosives, paints, oils, etc., was 349,600, an increase of 1500 on the figure for April and over 4000 more than at any time in 1946.

This evidence of rising activity is provided by the July *Digest of Statistics* now issued by the Central Statistical Office (H.M.S.O., 2s. 6d.), which shows fairly substantial rises of output from several sections of the chemical industry. Total production of sulphuric acid in May (in 000 tons) was 115.8, which was 6.3 better than the previous month and by far the highest output since January. Consumption of constituent materials rose proportionately but the stock position was fairly favourable.

(A fuller report will be given in next week's issue.)

Income Tax Assessment Procedure

Changes Resulting from Recent Legislation

THERE have been many changes during the past year in income tax assessment procedure, both administrative and legislative, and at this juncture it may be of interest to give a short explanation of these, together with other important maters. Particularly concerned are taxpayers under Schedule D (persons on own account; business profits), the relevant period being the year ended April 5, 1947.

Profits tax and excess profits tax payments are deductible, and interest received where treasury tax reserve certificates are taken out is not assessable. But any sum received as a post-war refund in connection with excess profits tax *is* assessable, and any interest received in connection with war damage value payments (not the capital sum) is chargeable with tax. Contributions made to universities and other educational institutions (even of a capital nature) in respect of technical instruction are allowed, if they relate to the particular trade of the taxpayer.

Such items as salaries or fees of scientific research workers, cost of materials and of repair and maintenance and so forth in connection with scientific research, are deductible as trading expenses. Furthermore, certain capital expenditure on scientific research (pilot plants, laboratories, etc.) is now allowed, this deduction, however, operating by yearly instalments over five years.

Trading Expenses

If an employer makes a contribution towards the purchase of savings certificates for his employees, part of that (usually one-tenth of the full amount) is allowed as a trading expense. Bonuses (*e.g.*, Christmas additions to remuneration) are taxable on the recipient, but the amount is deductible by the employer as a trading expense. Where employers have given goods as gifts to employees, these are not assessable, and if owing to the shortage of goods, savings certificates or other Government savings investments have been given instead, the recipient is not chargeable with tax.

Machinery and Plant Depreciation

Now obtainable is the new allowance for machinery or plant (the term a wide one, including motor vehicles and fittings and fixtures) of 20 per cent called an "initial allowance," where fresh machinery is installed. It applies equally to new or second-hand machinery, and is additional to the ordinary "wear and tear" yearly percentage allowances, which are now plus one-fourth and apply to every rate and unit. If, therefore, the basic rate is 20 per cent this is now 25 per cent. Moreover, if machinery is used more than usual (*e.g.*, on shifts or on overtime) ordinarily an extra allowance is obtainable; for motor vehicles in these cases the addition is one-quarter of the usual allowance.

A special depreciation allowance is now obtainable for buildings, machinery and plant erected or installed since December 31, 1936, as the date for determining whether the conditions for this allowance have been fulfilled has now been laid down as December 31, 1946. The Finance Act, 1947, allows a capital expenditure on all matters legitimately falling within the sphere of rehabilitation.

PARLIAMENTARY TOPICS

Match Industry Possibilities.—The c.i.f. value of imports of matches in the first six months of 1947 was £161,000 from Sweden and £231,000 from Belgium: Sir Stafford Cripps (President of the Board of Trade).—Mr. M. Orbach: While I agree that these amounts are comparatively small, may I ask my right hon. and learned friend if he is aware that if the production capacity of our home industry was fully employed, there would be no necessity for us to import any matches from abroad, in fact we could export matches?—Sir S. Cripps: That seems to follow from what the hon. gentleman has said.

£70 Recruits for Industry.—Asked what were the cost and the results of the Government campaign to attract women to enter industry, Mr. G. Isaacs (Minister of Labour) said that since the campaign started in June 7533 women had enrolled at Ministry of Labour Exchanges and more than 5000 were known to have obtained employment direct. The estimated cost of the campaign was £45,000.—Sir William Darling: Am I right in saying that the cost of each of these recruits is about £70 per head?—Mr. Isaacs: My mathematics do not go so far as working that out.

British Oil Earnings.—The total sales abroad of oil accruing from the operations of the British oil industry in 1946 represented about £100 million.—The Chancellor of the Exchequer.

An Alkali Inspector Sums Up—I

The Battle Against "Industrial Poisons"

by W. A. DAMON

THE story of a great U.K. industry, the manufacture of alkali products with its numerous associated ramifications, is reflected at many points by the application of the Alkali Act of 1863, its successor in 1906 and the various amending Orders which have helped to shape it.

The number of works originally registered under the Act was about 80. They are recorded on the first register. The number of registrations grew as the legislation was expanded until when the current Act was passed in 1906, the number stood at 1230 works embodying 1830 processes.

Since 1906, there has been a tendency towards amalgamation and the number of works registered has dropped to 1033, although the number of processes has increased to 1913. One can see the effect of this tendency very clearly on Tyneside where 50 years ago there were 21 saltcake and wet copper processes in operation. The last saltcake plant was closed in 1932 and but one wet copper works remains. In 1908 there were 37 chemical works on the Tyne registered under the Act. Now there are but 15.

Noxious Gases

Although there has been no revision of the Act itself since 1906, there have been Orders made under the Authority of the Public Health (Smoke Abatement) Act of 1926 which have had the effect of extending it. Such Orders were made in 1928, 1935 and 1939 and with these the Act now covers 27 processes which appear to be those potentially most offensive or dangerous from a health point of view.

Briefly, the Act provides that these processes (which are rigidly defined in a schedule) shall not be operated until they have been registered with the Ministry of Health and the major condition of registration is that the work shall be furnished with the "best practicable means" for reducing to a minimum the emission to atmosphere of noxious or offensive gases. Statutory limits of acidity are specified in connection with sulphuric acid chamber processes, concentration processes, saltcake processes and muriatic acid works.

The expression "best practicable means" is defined as having reference not only to the provision and efficient maintenance of appliances adequate for preventing the escape of noxious or offensive gases but also to the manner in which they are used. It is a somewhat elastic expression and its use as a condition of registration imposes on the inspector a duty of striking a fair balance between the desire of the community for unimpaired amenities and the just aspirations of manufacturers.

Consideration must be given to the possibility of recovering the waste gas in a useful form, the value of which may offset the cost of recovery. In this connection I would point out that quite frequently means which have initially been imposed on a somewhat unwilling manufacturer have later been developed to the point of becoming quite profitable.

Co-operative Spirit

I think it is generally conceded that the Act serves a useful purpose and I attribute its success to three main causes. The first is the precedent set up by the first Chief Alkali Inspector, Dr. Angus Smith, who invited and secured the willing co-operation of works managers rather than attempt to catch them out. I quote from page 61 of the First Alkali Report, *i.e.*, covering the year 1864:

"Beginning, as I did, with a strong desire to aid the public in the way most agreeable to the manufacturer, I could not forget that it was in his power to make the office of Inspector most difficult and disagreeable. I am happy, however, to say that in no instance has any act been performed to which we can in the slightest degree object. If in some cases the delay in making necessary alterations was greater than absolutely needful, it may be said that it was well to wait for full proof of deficient condensation and to satisfy the manufacturer of the accuracy of the statements."

Dr. Angus Smith wrote reports of great length and embodied in them his very sound philosophy of inspection. His reflections are well worth re-reading to-day. His policy has been continued ever since. It is more expedient and more expeditious to persuade than to prosecute.

Paying Proposition

The second cause is that in these days of competition every potential source of revenue must be examined and that many of what were at one time waste noxious products have been found to pay for recovery. It is in fact usually a paying proposition to clean up escaping gases and fumes. The third cause is the judicious recruitment of the inspectors from industry itself. Not only is the old saying about old poachers making the best gamekeepers true, but a man who has himself been responsible for the operation of chemical processes is likely to approach a problem from a practical point of view and is certainly more likely to secure the co-operation of the responsible works officials.

The Alkali Inspectors have been charged with being old-fashioned. It is true that we speak of muriatic rather than hydrochloric acid. Within the meaning of the Act a works for the production of ferric sulphate is a " nitrate of iron works " and the process of decomposing common salt with sulphuric acid is an " alkali work." Our measurements are expressed in grains per cu. ft. and, as required by the Act, they are to be made at " 60 degrees of Fahrenheit's thermometer and 30 in. of mercury pressure." Nevertheless, we have so far modernised ourselves as to discard the use of the words " phlogiston " and " alchemist."

Wartime Duties

It is, I suppose, inevitable that the Alkali Inspectors should be called upon to advise in all kinds of cases of complaint even though they do not relate to registered works. Just before the war they became involved in the matter of burning colliery spoilbanks. These often cover a substantial area and attain a height of 200 ft. When war was declared the matter became one of extreme urgency for the burning spoilbanks could be seen from the air at great distances. The alkali inspectors made a determined attack on this problem.

The most efficacious method of controlling spoilbank fires has been found to consist in continuous fine water spraying covering as large an area as possible and taking care that the water is sufficiently finely divided to soak continually into the mass. Where no water was available recourse had to be had to other methods such as covering with soil or clay. These methods were very successful and the spoilbanks were kept under control. Since the end of the war, however, the position has been deteriorating and a number of spoilbanks are again in a state of open combustion.

It is to be hoped that eventually some better method of dealing with spoil, (*e.g.*, underground stowage) will be developed, but the matter is not likely to receive much attention until the more urgent problems of coal mining have been solved.

So far as " Alkali " processes (*i.e.*, salt-cake processes) are concerned, there is no difficulty in maintaining a satisfactorily low escape. The process has in many instances been mechanised and made continuous by the use of rabbling arms in the decomposing chamber and absorption is now frequently effected in serpentine silica condensers instead of the old Gossage towers. The production of hydrochloric acid by this method has been largely superseded by its synthesis from chlorine and hydrogen. In either case, if an acid of more than 20 per cent strength is required, provision must be made for dissipating the heat of solution.

Cement Problems

Cement works have their own peculiar problem which relates to the emission of dust rather than offensive gas, though the latter is not unknown. The modern cement kiln consists of a long cylindrical slightly inclined rotating tube down which a slurry of chalk and clay in water is allowed to flow. At the lower end a great heat is developed by burning a blast of coal dust.

By the time the chalk and clay mixture has travelled the 250 ft. or more length of the kiln it has first become dried and then burnt to form cement clinker which is subsequently ground to produce Portland cement. At one point of its travel it has lost sufficient moisture to become friable and has not yet reached a temperature at which it clinkers. From this point the hot blast from the burners carries with it some dust which may eventually be emitted from the chimneys and deposited in neighbouring houses and gardens.

This problem has received much attention and substantial improvement has been effected: (1) by the use of chains suspended across the kiln at the wet end. The chains wetted with slurry not only act as a dust trap but also effect a saving in fuel. The chain system, from our point of view, should not extend beyond the point at which the raw materials reach a moisture content of 12-14 per cent. (2) By the use of external dedusters such as cyclones and electrical precipitators.

It is inevitable that industries should tend to concentrate in areas where by reason of availability of raw materials the conditions are favourable for their development. Thus, along the Thames Valley there is a productive capacity for 11,000 tons of cement per day. Although the slip of dust can be reduced to less than 0.4 grain per cu. ft., such a figure represents a total dust emission in the area of 30-35 tons per day.

Fewer Smelting Works

Smelting works in which sulphide ores are smelted are much less offensive than they used to be. 40 years ago there were about 80 such works, notably in S. Wales, in S.W. and in N.W. England. To-day there are less than 30. The calcination of tin ores is now practised in only three works. Smelting of lead ores has also been reduced and much of the preliminary roasting of copper and copper-nickel ores is now carried out overseas. At one smelting works the daily emission of sulphur dioxide was reduced by careful management from 14.3 tons in 1933 to 4.5 tons in 1938.

(To be continued)

SILICON ORGANIC COMPOUNDS—II

Resins, Varnishes, Silicone Liquids, Greases and Lubricants

by A. E. L. JERVIS and K. MOCHLINSKI

MOST of the troubles experienced in outdoor and indoor insulators are due to a combination of surface deposits and a humid atmosphere. Under most types of dry deposits the surface resistance remains high, but as soon as they become wet, the surface resistance decreases and surfaces become semi conducting. To overcome this trouble, all sorts of peculiarly shaped insulators have been designed.

In the case of porcelain and glass the damp does not penetrate the insulator but is "adsorbed" to the surface and forms a more or less continuous film, able to short-circuit the insulator. Waxes and greases have been used in the past to persuade the deposited moisture to break into droplets instead of forming a continuous film, but they were only partially successful because of their relatively low softening point and their poor adhesion to the glass or ceramic bases.

In contrast with these, fired polymerised silicone surface films are claimed to be water repellent—under conditions of high humidity and condensation of water on their surfaces—for a long period of time. Silicone water-repellents were used during the final years of the war to safeguard radio and radar equipment against failures due to deposition of water-films on such ceramic parts as coil formers, bases for high frequency transformers and wire-wound resistances.

Resins and Varnishes

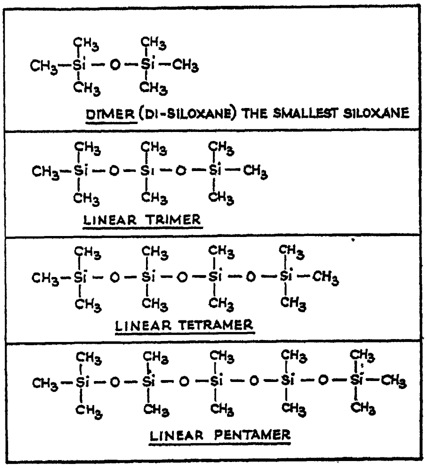
Developments in the field of silicone resins and varnishes make possible a considerable step forward in the insulation of electrical machinery and may considerably influence their future design. Organic resins and varnishes are the weak links thermally, when used in conjunction with inorganic materials such as glass, mica and asbestos. Since silicone varnishes and resins can be employed at high temperatures they make possible the full utilisation of the superior heat resistant qualities of inorganic materials.

While existing American standards allow the limit of 100° C. for class "A" insulation (purely organic—cotton, paper, etc.) and 120° C. for the class "B" insulation (inorganic base—mica, glass, asbestos, etc.) extensive tests show that class "B" insulation, with silicone varnishes replacing the organic ones, will permit a limit of 160° C. Machines of different sizes have been tested for very long periods under most adverse humidity conditions at temperatures reaching 300° C. with positive results. The output of some electrical machinery has been stepped up by as much as 25 per cent by the increase of temperature limits. In other cases the bulk weight of rotating machinery has been reduced by 20 per cent. Where temperature limits have determined the machine rating, the higher cost of new varnishes would seem to have been justified.

The advantages of silicone varnishes are that they enable the heat resistance of mica, asbestos, and glass to be utilised more efficiently, and they are reliable under difficult operating conditions. For example, when acids and moisture are present and temperature variations abnormal, they are fire resistant, and they contribute to economy of space, allowing bigger output from a given frame size.

There is a wide range of silicone liquids. Their behaviour is determined by the length of the basic chain and the number and type of cross linkages. Short, simple molecules form thin liquids, while more complicated ones form thicker liquids. Typical commercial liquids are shown structurally in Fig. 1, while Fig. 2 compares them with hydrocarbons. The viscosities and boiling points of the silicones in Fig. 1 are as follows:

Type	*Viscosity in cst*	*Boiling point °C*
Dimer	0.65	99.5
Trimer	1.0	152
Tetramer	1.5	192
Pentamer	2.0	230



$CH_3-Si(CH_3)_2-O-Si(CH_3)_2-CH_3$

$CH_3-Si(CH_3)_2-O-Si(CH_3)_2-O-Si(CH_3)_2-CH_3$

$CH_3-Si(CH_3)_2-O-Si(CH_3)_2-O-Si(CH_3)_2-O-Si(CH_3)_2-CH_3$

$CH_3-Si(CH_3)_2-O-Si(CH_3)_2-O-Si(CH_3)_2-O-Si(CH_3)_2-O-Si(CH_3)_2-CH_3$

Fig. 1. Liquid silicones

Stability under extremes of temperature, slow change of viscosity with temperature, freedom from oxidation, chemical inertness and good electrical properties characterise these liquids. One typical silicone fluid having a viscosity near to that of the water freezes at -25° F. and boils at 300° F. The change in viscosity of a typical silicone oil for a given change of temperature is 14 times less than that of a typical petroleum oil.

The principal applications of silicone liquids are as instrument oils, hydraulic oils, dielectric fluids and condensation pump oils. Silicone fluids have also found many applications in aircraft navigational equipment operating under extremes of temperature.

Because of their smaller surface tension, silicone liquids are characterised by a flat meniscus and are therefore very useful for manometers. Another interesting application is the use of minute additions of silicone oil to prevent foaming, a very important consideration in oil circulating cooling systems. Their high stability and good electrical properties suggest the use of silicone oils for the oil-filled capacitors. They can also be employed as cooling oils for transformers. They are particularly advantageous at high frequencies, because of their very low power factor.

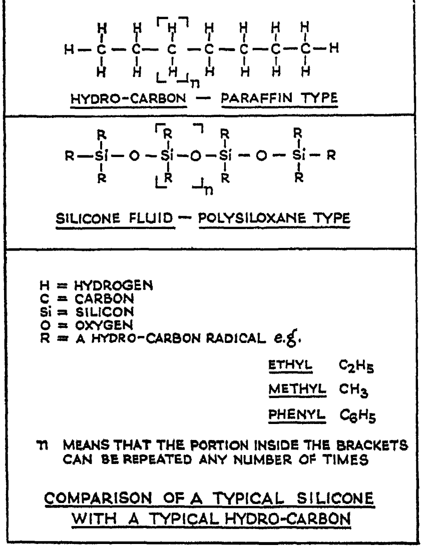

HYDRO-CARBON — PARAFFIN TYPE
SILICONE FLUID — POLYSILOXANE TYPE
H = HYDROGEN
C = CARBON
Si = SILICON
O = OXYGEN
R = A HYDRO-CARBON RADICAL e.g.
ETHYL C2H5
METHYL CH3
PHENYL C6H5
n MEANS THAT THE PORTION INSIDE THE BRACKETS CAN BE REPEATED ANY NUMBER OF TIMES
COMPARISON OF A TYPICAL SILICONE WITH A TYPICAL HYDRO-CARBON

Fig. 2

Greases and Lubricants

In general, silicone greases can be characterised as waterproof, chemically inert, oxidation resistant, relatively non-volatile, and very stable under a wide range of temperature variations. These qualities have led to the use of silicone greases as lubricants for ball-bearings having to work under adverse temperature conditions, glass and ceramic stopcocks, pressure lubricated valves, oxygen supply lines to rotating aircraft turrets, high temperature controllers used as oven timers, and fluorescent lamp tubing (during manufacture).

For lubrication of high-speed bearings working in extremes of temperatures special greases, thickened with carbon black (or silica white) and metallic soaps have been produced. One typical example of silicone lubrication working under very difficult conditions is noteworthy. Thirty thousand small D.C. aircraft motors with 4 m.m. dia. ball bearings, were successfully lubricated. These motors had to operate at temperatures of - 85° F. and below. Rapid starting and rapid attainment of full speed (10,000 r.p.m.) were essential.

Sealing Compounds

Silicone sealing greases, used for preventing breakdowns in aircraft ignition systems are one of the most popular of the silicone compounds now in commercial use. Because of the reduced air pressure associated with high altitude, corona discharge led to very frequent failures of ignition systems. This very urgent problem of military aviation was solved by using the silicone compound in the form of a grease, having high dielectric strength, which does not harden or flow between - 40° F. and 400° F., and which is at the same time moisture resistant and non-hydroscopic, as well as chemically inert towards the insulation materials. Applied to spark plug wells and disconnecting junctions, it excludes air from them and prevents the formation of short-circuiting water films. When arcing does take place, the principal decomposition product is silica and tracking is therefore not as serious as with the ordinary organic insulation.

Mainly because of its high electrical resistivity and moisture excluding properties this particular silicone compound has been also widely used in radio and radar systems.

(Concluded)

Chromic Acid Shortage

Chromic acid is in short supply, and means of conserving it are therefore of interest to producers of chromium plated goods. A technical note on its conservation has been prepared, and copies may be obtained from the Secretary, Metal Finishing Committee, Ministry of Supply, c/o W.R. (D)2, Room 1033, Shell Mex House, Strand, W.C.2. Inquirers should ask for: Supplement to E.T.A.C. Technical Memorandum No. 1, "Conservation of Chromic Acid during periods of shortage."

SYNTHETIC PRODUCTION OF PETROLEUM—I

Hydrogenation and Fischer Processes

by MAJOR KENNETH GORDON*

THE Fischer process for the manufacture of petroleum products from coal is a true synthetic one since the hydrocarbon molecules are produced by building up complex molecules from carbon monoxide and hydrogen. The product made by the hydrogenation process, although commonly referred to as synthetic petrol, is not synthetic in the true sense of the word at all since it is produced by the breakdown of the more complex molecular constituents of coal itself, or its derivatives such as tar.

It is not possible here to deal with the subject more than briefly. For a more detailed survey of the development of these synthetic processes in Germany the report to be issued shortly by the Stationery Office ("Report on a Study of Liquid Fuel Processes in Germany") should be consulted.

Hydrogenation Problems

In the hydrogenation process, coal is converted into liquid hydrocarbons by the simplest and most direct method possible. Neglecting the minor constituents of coal, such as oxygen, sulphur and nitrogen, and attributing to each of these the hydrogen required for its elimination as the appropriate compound, the empirical composition of the remaining hydrocarbon constituents of coal is approximately CH_5.

The empirical composition of the petroleum products we desire to manufacture is approximately CH_2. In the hydrogenation process the requisite quantity of hydrogen is added at a suitable pressure and temperature in the presence of an active catalyst. In the case of coal itself we have the complication that we are dealing with a solid which contains a certain amount of mineral matter, however carefully the coal is cleaned. The elimination of this mineral matter, together with a small proportion of the more resistant part of the coal which remains as a solid, is one of the difficulties of the process. Further, it has not so far been practicable to introduce coal into the high pressure vessels in its solid state, and it is usual to mix it with its own weight of heavy oil so that it can be handled in pumps.

These complications involve recycling considerable quantities of materials through the plant with the attendant losses. The solid residue is eliminated by a combination of centrifugal treatment and distillation, and, of course, it can be consumed as part of the fuel requirements of the factory.

The crude hydrogenation product from coal covers the same sort of boiling range as does natural petroleum. The fractions boiling below 180° C. are substantially pure hydrocarbons. The fractions boiling above 180° C. contain substantial amounts of phenols and smaller amounts of organic bases. These higher boiling fractions are commonly known as middle oil and have to be hydrogenated in a second stage for conversion to hydrocarbons.

Four Stages

For the treatment of coal under the most favourable conditions one would say that four stages are at least theoretically desirable. In the first stage the solid coal is converted to a mixture of oils. In the second stage the heavy oil fraction not susceptible to treatment in the vapour phase, is hydrogenated in the liquid phase In the third stage the middle oil produced from this source is given a light hydrogenation treatment which we call "saturation", of which the main purpose is the elimination of nitrogen compounds which poison the catalyst in the last stage. In this last, or "splitting" stage, the hydrocarbons are broken down to those of the required molecular weight.

During the course of these stages a substantial proportion of the hydrocarbon material is broken down to lower molecular weight compounds than are necessary, and they appear as the hydrocarbons methane, ethane, propane and butane.

In the early stages of the process, where conditions are such that no more active catalyst can be employed, these hydrocarbons are found in practically equal proportions by weight. In the latter stages, where extremely active catalysts are employed, we find that there is a big preponderance of butanes and particularly isobutane, a smaller amount of propane, and scarcely any ethane or methane at all. The formation of these hydrocarbons involves a lower yield of liquid products than is theoretically possible, and, of course, the consumption of more hydrogen than is necessary for making liquid products.

The overall yield from the hydrogenation process depends upon the raw material and upon the product which is being made. From bituminous coal we can obtain rather less than 50 per cent of aviation spirit and rather more than 50 per cent of ordinary motor spirit. At the other end of the scale, from a light distillate oil made either from brown coal or bituminous coal tar we can get yields as high as 90 per cent. The amount of hydrogen similarly varies from figures in the region of 3600 cu.m. to 1000 cu.m. per ton of finished product.

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* Paper presented in the symposium, "Newer Derivatives of Coal and Petroleum" at the University of St. Andrews.

German Procedure

The processes employed in Germany have operated from 200 atmospheres to 700 atmospheres pressure. The newest German plants worked at 700 atmospheres, but it is rather doubtful whether such a high pressure is really necessary. Pressure of 200-300 atmospheres, which was employed in the earlier plant is undoubtedly on the low side, and it is probable that some intermediate figure would be the best.

The engineering problems connected with the hydrogenation process may be regarded as completely solved. The German plants at the end of the war had a capacity of some 4 million tons a year. In this country we have hydrogenation plants with a capacity of approximately 500,000 tons a year.

A part of the process where an improvement is desirable is that connected with the recovery of oil from the solid residue. Also the discovery of some more active catalytic conditions which could be employed in the presence of coal itself would be a great improvement. It is difficult to see, however, how anything sufficiently revolutionary to alter the general economic picture can be forthcoming.

Rising Costs

The survey of the costs in Germany, translated into English conditions, which is given in the forthcoming report to which I have referred, indicates that the capital cost would be of the order of £60 per ton year of product, and that the operating cost, including amortisation but no profit, would be in the region of 2s. per gallon, or nearly four times the cost of imported petrol.

It will be appreciated that the prospects for hydrogenation or any other synthetic oil process have become very much more unfavourable since serious work started on it in this country 20 years ago. The cost of coal has multiplied by four since those early days, the cost of labour has increased to over double what it was then, and the cost of other materials has risen correspondingly, whereas the value of the product, neglecting the question of protective duty, has remained very much as it was then. But its quality, and hence its cost of production by any means and from any source, has increased

The properties of the petrol produced are extremely favourable for all purposes. This is due to two causes. The structure of coal is undoubtedly such that breakdown during the process gives cyclic hydrocarbons. Further, the very active catalytic conditions employed in the vapour phase stages of the process give isomerisation to the most stable hydrocarbons, that is to say, isoparaffins and naphthenic compounds, which are of great value from the point of view of knock rating.

Whether a petrol has been derived by hydrogenation can indeed easily be detected by its composition, a fact that was of some little value to us during the war since the Germans were kind enough to present us with frequent samples of aviation petrol in various parts of this country.

High Grade Spirits

The properties of the petrol from every other point of view are equally good, as one would expect from the nature of the process employed. The sulphur content is very low, the tendency to gum formation almost absent, and the volatility, upon which the starting properties depend, can be controlled to any desired degree.

Straight petrol can be made with an octane number of anything up to 80. By the addition of lead this figure is increased to 95 or so. If a better petrol than this is required for aviation spirit, then the isobutane which is made in substantial quantities when high volatility is aimed at, can be converted to iso-octane, and this process was employed both at Billingham and at Heysham during the war.

The hydrogenation process is not without interest as a source of chemical materials. Propane and butane, for example, have now been available for some years, and they can easily be converted into their corresponding olefins by dehydrogenation. Isopentane is also available in substantial quantities and from this many organic compounds can be made by oxidation. Cyclohexane is another important constituent and this can give rise to cyclohexanol and cyclohexanone by hydrogenation and to benzene by dehydrogenation.

Substantial amounts of phenol, cresol and xylenol are present in the crude products made by hydrogenation of both coal and tar, are easily separated, and are a valuable contribution to revenue.

(To be continued)

Italian Rubber Industry

Raw materials for the Italian rubber industry are reported to be in better supply. About 11,000 tons of natural and synthetic rubber are expected to arrive between now and the end of the year. The outlook for 1948, however, is not so bright because there is a shortage of dollars in Italy, as well as elsewhere. Manufacturers are unlikely to receive much help from the Government, which is already finding it difficult to find enough dollars to pay for coal, petroleum and iron.

NEW YORK BARS NITRATE CARGOES

SHIPS ORDERED TO QUIT THE PORT

AMERICAN reaction to the fresh evidence of the dangerous potentialities of ammonium nitrate, exhibited by the recent disastrous explosion at Brest, is reflected by the action of the New York Fire Commission on July 30 in ordering two ships loaded with ammonium nitrate to be removed immediately from the Port of New York, describing them as a " serious menace to the people of the city." The steamships, *Molda* and *Madaket,* each carried 3000 tons of the nitrate.

" Danger Money " Demand

The 7850-ton S.S. *Molda,* operated by the Cosmopolitan Shipping Company, was scheduled to pick up a general cargo in New York. Prior to her withdrawal from the port, longshoremen walked off the Europe-bound freighter after their demand for " munitions " pay was refused. Eighty longshoremen demanded that they receive double their usual rate of pay of $1.65 hourly. $3.50, it was pointed out, is the standard hourly pay-rate for loading munitions ships. In refusing the demands of the longshoremen, operators of the *Molda* pointed out the classification of ammonium nitrate has not been changed to dangerous and that until such a change is made regular loading rates should prevail. Meanwhile, the *Molda* is anchored at the ammunition anchorage of Gravesend Bay.

The second vessel ordered out of the port, the 6165-ton S.S *Madaket,* operated by the Waterman Line, sailed for Antwerp, Rotterdam and Bremenhaven without waiting for her 1200 tons of general cargo to be put aboard. The Waterman Company, through its general Eastern traffic manager, has pointed out that the Bureau of Explosives of the Association of American Railroads, in its report on ammonium nitrate, "after exhaustive tests under the most adverse conditions," failed to determine that this commodity was "highly explosive," as described by the Commissioner. The company also points out that thirteen fruitless attempts had been made to explode ammonium nitrate. These attempts included firing a rifle bullet into the compound, detonating it with detonating caps and dynamite, tossing quantities of it into fires, heating it up to 700°F., and subjecting it to impact and friction tests.

Current Regulations

Present regulations governing ammonium nitrate prohibit the loading or unloading of the chemical at New York piers. Ships arriving in New York with ammonium nitrate in their holds are required to keep the holds battened down. No other cargo is permitted in the same hold and, in addition, a detail of uniformed firemen, as well as department inspectors of combustibles, is assigned to such ships as soon as they dock.

As a result of the Brest explosion, Douglas Wise, vice-president of the Terminal Shipping Company, Baltimore, has announced that the ship had taken more than 3000 tons of ammonium nitrate. He said that the company, remembering the Texas City disaster last April, took unusual precautions with the cargo.

New Fire Precautions

Meanwhile, in Norfolk, Virginia, on July 24, strict rules affecting the handling and storage of ammonium nitrate were adopted by the City Council. In Washington, D.C., one official expressed concern that the Brest explosion might lead to " prohibitive insurance, stevedoring, freight and storage rates, making it impossible to carry out the world nitrogen fertiliser programme."

Nitrate Ship in Flames

Ten Killed by Melbourne Explosion

FIRE and explosions among drums of sodium nitrate in the hold of the British *S.S. Mahia* in Melbourne harbour last week resulted in the deaths of 10 dockers and painters, who were stated to have been trapped below decks by the rapidity with which the blaze spread. The rest of the ship's £100,000 cargo, composed largely of match sticks and newsprint, almost immediately was ablaze and after efforts to control the flames had continued for seven hours, holes were cut in the vessel's sides and she was sunk in 35 ft. of water. On the quays nearby were oil stores, stacks of newsprint and timber. About 200 yards away was a gasworks.

The secretary of the Watersiders' Union later said that the explosion would " strengthen demands that explosives should not be handled at Australian wharves."

Nitrate Alarm in Belgium

Firemen at Renaix, on the French border of Belgium, extinguished a blazing wagon load of nitrate of ammonia in the railway station, after police and railway officials had warned the whole town that it might be necessary to evacuate the locality. The cause of the outbreak has not been definitely established and the theory current is that it arose spontaneously during a period of intense heat.

NEW DEGREES FOR TECHNOLOGISTS

Parliamentary and Scientific Committee's Proposals

THE development and extension of technological education and conferment of greatly improved status on technical colleges are recommended in the 10,000-word report which the Parliamentary and Scientific Committee submitted last week to the Lord President of the Council and the Minister of Education on "Colleges of Technology and Technical Manpower." The report was prepared by a special sub-committee under the chairmanship of Mr. W. T. Wells, M.P., and its membership included Prof. Alexander Findlay (president of the Institute of Chemistry), Dr. H. J. T. Ellingham (the Institute of Chemistry), Dr. R. E. Slade (past director of research, Imperial Chemical Industries, Ltd.), Mr. G. L. Bailey (British Non-Ferrous Metals Research Association), Dr. J. R. Scott (Research Association of British Rubber Manufacturers), and Mr. Cecil Dixon (Association of Scientific Workers).

University Standards

The report is concerned only with the major technical colleges, those having technological courses equivalent to university degree courses. At present some 27 colleges, ten of them in the London area, provide full-time higher technological courses of up to three years' duration and it is intended to raise others to this standard. The sub-committee, in its introduction to the report, stresses the marked lead which other countries enjoy and are now increasing in technological education and the benefits that has conferred upon their industries, notably in the commercial application of scientific discoveries originally made in this country, and affirms that: "With adequate provision for higher technological education, this country could again secure the benefits of our technical and scientific achievements in the development of our industries, reach equality with our competitors in technical manpower and regain our pre-eminence in the markets of the world."

In the past (says the report) there has prevailed in certain quarters an unjustified belief that it was not appropriate to extend university recognition to technological studies on the ground that the content of the courses did not warrant it. However, it is now more widely appreciated that the study of a technology necessarily involves a thorough groundwork in the pure sciences. It has been contended that students should attend a pure science degree course and should acquire their knowledge of technology in a post-graduate year. However, an adequate study of many branches of technology cannot possibly be made in a post-graduate year.

It is therefore contended (a) that the study of selected branches of technology presents a problem which cannot be solved by devoting to it a post-graduate year, and (b) that therefore the study of selected branches of technology, together with the appropriate basic scientific foundation, should lead to the award of a degree with national and international currency in order to attract into these courses a fair proportion of men and women of high ability.

Recommended Subjects

The committee points out that many colleges of technology do prepare students for university degrees. But others have not been so recognised and have had to rely on the University of London external degree as their ultimate reward.

As a result of a questionnaire to principals of technical institutions, the following branches of technology were recommended as being suitable for the award of a degree: Mechanical engineering, electrical engineering, civil engineering, chemical engineering, production engineering, structural engineering, mining, metallurgy, surveying, building, architecture, textiles technology, oil (petroleum) technology, pharmacy, rubber technology, plastics technology, technology of paints, varnishes and lacquers, industrial fermentation, colour chemistry and dyeing, ceramics (pottery), food technology including nutrition.

Facilities for degree awards in most of these subjects are either inadequate or non-existent, the committee affirms.

Award Authorities

The excellent work done by professional institutions in the award of qualifications is recognised and it is anticipated they will give valuable assistance to regional organisations and a National Council of Technology.

These organisations, recommended by the Percy Committee and accepted by the Minister of Education, would consist of an Advisory Council and an Academic Board for Advanced Technology in each of the ten regions into which the county would be divided for the puruposes of higher education. The Advisory Councils would be concerned with the organisation and development of higher education and the Academic Boards, composed principally of heads of universities and colleges of technology and members of teaching staffs, would be responsible for the development and co-ordina tion of advanced technology and establishment of good working arrangements between the university and college staffs.

The regional machinery will have its national counterpart in a central body, which, the Minister has suggested, should be entitled the National Council of Technology and which should be at least partly representative of the Regional Advisory Councils and of the Regional Academic Boards. No detailed proposals of the constitution of the National Council have been made, but it would be responsible for considering the national aspects of regional policies, for consultations with the University Grants Committee and for advising the Minister of Education.

Awarding Degrees

The recommended solution to the problem of qualification is that the local university should extend its recognition to appropriate departments of the colleges of technology and award degrees. If, however, in any particular region, this procedure cannot be adopted, the National Council of Technology, in conjunction with the University Grants Committee, is the organisation to which the problem can most suitably be referred. The National Council of Technology might, itself, award degrees or consideration might be given to the establishment of one or more organisations for granting degrees on a national or geographical basis.

Another of the sub-committee's objectives is to stimulate and widen the comparatively small amount of research work now carried on by the technological institutions and to encourage the training, by the publication of papers and award of higher degrees, of post-graduate research workers. At the moment, the report notes, although the colleges are full to overflowing the number of students who plan to undertake research work will in all probability be small.

Better Salaries

Courses of study envisaged will demand highly qualified lecturers and more expensive and specialised equipment. Staffing with highly qualified lecturers will depend upon salaries offered and conditions of service. In this connection, the report notes that the Percy Committee recommendation that colleges of technology should offer to staffs salaries and conditions similar to those at the universities has not yet been accepted and the provisions of the report of the Burnham Committee on salaries of teachers in colleges of technology do not adequately meet the problem.

Lecturers in colleges of technology are paid on a Burnham basic scale with a minimum of £300 rising by £15 to a maximum of £525 for men, and a minimum of £270 rising by annual increments of £12 to a maximum of £420 for women. This basic scale which is offered to lecturers in advanced subjects, who must also usually be capable of research in their subject, is exactly the same as that offered to teachers in primary schools dealing with pupils of the age range 5 to 11. It is ridiculous to suggest that these scales attract satisfactory lecturers to the colleges of technology. They do not. Many colleges of technology, in fact, cannot obtain satisfactory teachers of advanced subjects.

To maintain the standard of work, and to secure the employment of highly qualified staff, the Minister (the report recommends) should invite the Burnham Committee to make provisions for special scales of salaries applicable to the staffs of the selected departments of colleges of technology comparable with those for staffs of universities. A head of a department (or professor) might, for instance, be paid a minimum basic annual salary of £1400; a senior assistant (or reader), £800 to £1200; a lecturer, £400 to £850, with appropriate family allowances.

Emphasis on Applied Science

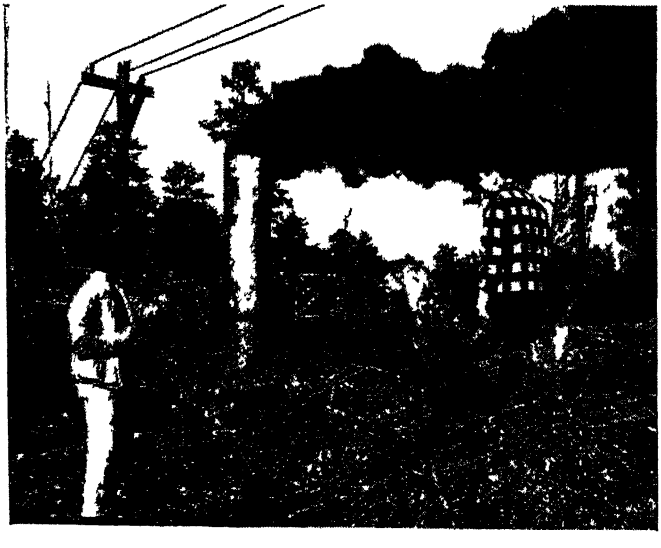
In summarising its recommendations, the sub-committee recalls that the report prepared by Dr. V. Bush (Director of the U.S. Office of Scientific Research and Development) at the request of the late President Roosevelt, urged that in future America should pay increased attention to discovering fundamental knowledge no longer available from war-ravaged Europe. The aim in this country, says the sub-committee, should be to pay more attention to applied sciences, without, however, prejudicing needed developments in academic education in all its forms. "Our colleges of technology must be adequately staffed, well equipped, and fully recognised as of university rank. Then, and only then, will they be able to make an adequate and essential contribution to our industrial prosperity and national well-being."

Among other points raised in the report are a recommendation that students wishing to undertake research after their bachelor degree should do their national service training on leaving the secondary school; technical state scholarships for students wishing to study to a high standard should be increased in number and more widely publicised; consideration should be given to the establishment of loan funds for promising students in colleges of technology; and that reasonable freedom should be given to influential and representative governing bodies of colleges in directing the affairs of the colleges and incurring expenditure within the approved estimates.

U.S. UNDERGROUND GASIFICATION

Openings into the isolated seam for observation of the burning coal and, above, pipes for sampling gas and recording temperatures

Underground gasification of coal, pioneered by Russia in the past ten years is now being intensively studied by other countries In the United States an experiment was recently conducted at Alabama, to find out whether gasification *in situ* was an economic proposition A small 36 in seam of coal was isolated from the main seam and prepared for burning A relatively thin overburden—about 30 feet—prevented high pressures of air and steam being used, so the temperature could not be raised above 2000°F The best results were with oxygen and steam blasting, which yielded a gas with a value of 220 B Th U per cu ft Some of the surface installation is shown in these pictures



Smoke and gas from the burning coal issuing from one of the two 40 ft. exhaust stacks. Each stack, together with air and steam pipes, was built into one of the gallery entrances so that air or steam could be blown in at either end

SCENES AT THE ALABAMA EXPERIMENT

One of the points for observing the burning coal was fitted with a Pyrex glass window through which direct observation can be made. Thermo-couple and gas connections are fitted to the door

Canadian Chemical Notes

Widespread Search for More Agricultural Chemicals

MR. W. B. TIMM, Chief of the Bureau of Mines, has just told a Canadian Senate Committee that it was too early to state if recent potash discoveries in Saskatchewan and phosphate in the Saguenay district are in quantity and value to be worked economically. He was testifying before the Resources Committee of the Senate, which is inquiring into the possibilities of making Canada self-sufficient in chemical fertilisers. The preliminary investigations on a motion of Senator J. A. McDonald (Nova Scotia) will be carried to completion next session. Canada, said Mr. Timm, now is importing phosphates for fertilisers from Florida and Montana and potash from New Mexico and California.

* * *

Since May 18, plant scientists of the University of Manitoba have been attempting to determine what damage to wheat, oats, barley and flax results from applications of two forms of 2, 4-D, the chemical weed-killer. Prof. P. J. Olson said conclusions regarding his experiments will not be reached until harvest time, when yields per acre can be calculated. By then scientists in various parts of North America expected to present their findings to a convention. A corn plot treated with 2, 4-D was virtually free of weeds. Barley, in another plot, appeared to be " taking a beating," but it will not be known until fall whether the yield was lower or higher than average.

* * *

Preliminary details of anticipated output are now available relating to the new chlorine and caustic soda plant, which, as already announced, the Dominion Alkali and Chemical Co., Ltd. (subsidiary of the Dominion Tar and Chemical Co., Ltd.) is to erect at Beauharnois, Quebec. The plant, for which the H. K. Ferguson Co., industrial engineers and builders, has been awarded the contract, is intended to have a daily output of 60 short tons of chlorine and 67 short tons of caustic soda of rayon grade. Hydrogen will also be produced on a commercial scale. Building is to start almost at once with a view to starting actual production in January.

* * *

Preference shareholders of Standard Chemical Co., Ltd., unanimously approved a by-law authorising the issue of a further 20,000, 5 per cent cumulative redeemable preference shares in excess of the 10,000 shares now outstanding. The proceeds will be used in part to provide for continuance of current expansion.

American Chemical Notebook

From Our New York Correspondent

A SERVICE school in petroleum chemicals on a post-graduate level has been established by the E.I. Du Pont de Nemours Company as the first step in an enlarged research, sales and technical programme. The course in the "industrial college" combines practical and theoretical aspects of petroleum chemistry and extends over many months, depending on the subject matter and the degree of specialisation sought. The technical background of the men enrolled embraces collegiate studies in chemistry, automotive, mechanical and petroleum engineering, plus a substantial amount of specialised practical experience. After an introductory course at Du Pont's Delaware, headquarters, the students transfer to the Deepwater Point, New Jersey, plant for courses in lubricating oils and petroleum additives. Their next studies are at the petroleum engineering laboratory on engines, fuels and their performance, practical application of additives and their uses and how anti-knock mixtures react in fuels. Students finally specialise in various lines for about five months. At the end of the course the graduate is assigned to various Du Pont districts.

* * *

The United States armed forces wasted the technical skill of 40 per cent of the chemists and chemical engineers in World War II, according to a survey made among its members and just released by the American Chemical Society. A report prepared by the society, on the basis of the survey, recommends immediate formulation of a comprehensive programme for efficient utilisation of technical manpower, both inside and outside the military services, in the event of another national emergency. Of 31,000 members of the American Chemical Society 4506 (about 15 per cent) were in the armed forces. About 58 per cent were detailed to industry, 17 per cent were on government-sponsored research, and 8.5 per cent were concerned with teaching. Pointing out that many chemists entered the Services through the organised reserve corps, the report declares: "Of these about 35 per cent were not properly utilised. Those holding the doctorate degree fared somewhat better, with about 20 per cent reporting improper utilisation. Similar percentages hold for those who accepted direct commissions. Among those who voluntarily enlisted or were drafted, the percentage who claim improper utilisation is much greater. Lack of trained personnel people, job analysts, and pressure of active combat fronts were among factors that contributed to the failure to use more of our scientific personnel as efficiently as was possible." Many men who were in the organised reserves or who accepted commissions were assigned immediately to purely military duties, the report continues, and many others were lost to important production jobs when they enlisted or accepted commissions because they felt it was their patriotic duty or because of the attitude assumed by some draft boards. "Approximately 78 per cent of the members reporting military service were below 35 years of age, and of these almost 50 per cent report improper utilisation," the report states. In all, the poll indicated that almost half of those in military service were improperly used in regard to their scientific training. The report concluded that: "A large portion of our scientific manpower was not efficiently utilised."

* * *

During the war a new, accurate and rapid method to determine the volume of water in paints and varnishes was developed by the (U.S.) Paint and Chemical Laboratory Branch for the Ordnance Research and Development Centre. The process is a further application of the Karl Fischer reagent, also used for water determination in oils, fats, waxes, glue, plasticisers, and many other substances. The titrimetric method requires only one hour to determine to 0.1 per cent the amount of water in any varnish and almost any paint. In addition to its speed and accuracy, the new water-analysis method has the advantage of requiring only small samples. The analytical procedure calls for weighing 10-20 grams of paint or varnish into a carefully dried glass-stoppered flask to which anhydrous pyridine is added from a burette. Almost 10 ml. is used for thinned samples and up to 25 ml. for unthinned. The mixture is then swirled thoroughly and 25 50 ml. of Karl Fischer reagent is added at once. Next the flask is stoppered, placed in a water bath at 50° C., and swirled at 10-minute intervals for 45 minutes. The flask is then allowed to cool, after which electrical titration is accompanied by adding pyridine containing 0.1 per cent of water. The standardisation of reagents completes the operation. Details of the operations, including determination of interfering substances, such as zinc oxide, are given in a report (No. PB-52027, "Volumetric Determination of Water in Paints and Varnishes") which is being placed on sale in microfilm or photostat form for $1.00 this week by the Office of Technical Services.

* * *

The United States Department of Commerce has reported that manufacturers' sales of chemicals and allied products dropped almost $400 million in May from April sales of $850,390,000. The drop of 14 points in the index of value of deliveries by the chemical industry, however, was due in large part to a commensurate drop in prices during May. While the physical volume of products sold varied little from April, price declines centring in fats and oils and in the drug-pharmaceutical-cosmetic group brought the dollar volume down to $810,480,000. The May value of shipments was, however, still more than two-and-a-half times greater than average monthly pre-war shipments of $330,700,000. Manufacturers' inventories in the chemical and allied industries rose 6 per cent in May to a total of $1,584,600,000.

* * *

Conditions in the United States for the chemical industry as a whole continue to be favourable. In many instances chemical companies are expanding plant facilities, new plants are being opened, and new ventures are being undertaken. Production is at near capacity for almost all companies and in general a healthy atmosphere pervades the industry. The strong demands for chemicals from the synthetic textile industries, the plastics and other fields continue to keep production at peak level and financial reports show that most, if not all, companies are enjoying record or near-record profits. The Davison Chemical Corporation's earnings for the fiscal year ended June 30, 1947, are estimated at approximately $1,650,000 by Chester F. Hockley, president. Sales were approximately 25 million dollars, the best for any peacetime year, an increase of about $1,700,000 over the previous year. The Monsanto Chemical Company's sales during the six months ended June 30, 1947, amounted to $71,085,736, an increase of 41 per cent over the corresponding period of 1946. The company's net income for the period was $9,275,133. "Excellent progress is being made at Texas City on reconstruction," said the chairman (Mr. E. M. Queeny). "Clearing of the site has almost been completed." The company's present net income is more than $3 million better than in the corresponding six months of 1946 The Hercules Powder Company, in the six months ending June 30, showed a net profit of $7,312,900. The General Electric Company, in the first half of 1947 had a net income of $37,979,536 after all deductions, including $23 million for taxes. The Union Carbide & Carbon Corporation and its subsidiaries have just reported a consolidated net income of $16,886,312 for the second quarter of 1947. Consolidated net income for the six months ending June 30 was $36,071,419, as compared with $24,657,976 for the same period of 1946.

The Office of International Trade of the U.S. Department of Commerce has just announced allocation of 120,000 short tons of tin plate to foreign nations for the fourth quarter of 1947. These allocations, it was announced, are to be given priority assistance and be used for packing of perishable food products abroad. An additional 22,000 short tons of tin plate for packing of U.S. imports, including oil products, will also be available for foreign use but no supply assistance will be granted by the Office of International Trade. Latin America and Europe received allocations totalling 42,925 tons and other allocations were: Australia, 12,800 tons; Brazil, 10,500; Argentina, 9000; Netherlands, 9500; Belgium, 6500; France, 6300; Norway and South Africa, 6000 each.

* * *

Two special 300 h.p., 240 r.p.m. inert-gas-filled synchronous motors now being built by the (U.S.) General Electric Company for use in an inflammable atmosphere incorporate all necessary features in one design. The enclosure has built-in coolers and a sealed chamber which is filled with a non-combustible gas and the gas is under sufficient pressure so that any leakage will be outward and no air or inflammable gas will get into the motor. By removing only one access cover, the field leads, stator leads, terminal boards, and bridge resistors for the temperature relay are accessible. The inert gas follows unrestricted flow lines in the cooler, which is located over the motor, to give efficient heat transfer. Resistance temperature detectors are imbedded in the stator windings and are used with a temperature relay to remove the motor from the line in the event of the temperature of the stator windings becoming excessive.

* * *

One of the disadvantages in the use of metallic yarn for dress fabric, is its susceptibility to tarnish. A U.S. plastics manufacturer, it is reported, is now marketing a thin aluminium yarn covered with a plastic material in which gold, copper or silver hues have been impregnated. In addition to being lighter in weight than the earlier metallic cloths, the new fabrics can be washed or dry-cleaned without ill-effect.

Plates from Cellulose Fibres

With the active participation of the Dynamit A.G., formerly Alfred Nobel & Co., the Eifel Cellulose Company has been established. At Dollendorf this firm will produce plates of cellulose fibre by a new manufacturing process. All kinds of timber waste and slabwood, including broom and heather, will be used as raw material.

High Capacity Mercury Cell

New U.S. Aid to Caustic Soda Production

THE production of a stationary mercury cell which produces caustic soda of high purity and offers certain operating economies is announced by The Mathieson Alkali Works, of New York. The new cell produces 50 per cent liquor directly at the cell, a much more concentrated solution than is ordinarily obtained. Also, as compared with European mercury cells, it is claimed that it conserves floor space, requires less power and makes use of less costly construction materials. Under development for 17 years, a small commercial installation of the stationary cell has been in operation at Mathieson's Niagara Falls plant since 1939.

Licensing arrangements, on a royalty basis, are available to companies in foreign countries and under certain conditions to companies in the U.S.A. Licences have been granted to companies in Canada and South America and plants are now under construction. Development of the new cell was initiated by Colonel C. F. Vaughn and carried on by Dr. William C. Gardiner.

Two Processes

The new cell incorporates a number of Mathieson discoveries which have resulted from more than 50 years of experience with mercury cells. Such cells produce caustic soda by the electrolysis of brine in two stages. In the first stage, sodium amalgam and chlorine are formed. In the second stage, the amalgam is decomposed to form caustic soda and hydrogen.

The new cell consists of two chambers, an electrolyser and a decomposer, between which is a pump. In the electrolyser, brine contacts a mercury cathode and a graphite anode. In operation, direct current is passed through the electrolyser, forming sodium amalgam at the cathode and chlorine gas at the anode.

The sodium amalgam is pumped to the decomposer, where it becomes the anode (graphite packing constituting the cathode). The sodium of the amalgam reacts with water in contact with the graphite packing, to form caustic soda and hydrogen gas. The mercury, now practically freed of sodium, is recirculated to the electrolyser.

The anode has a flexible connection, which permits it to be raised or lowered, thus allowing the anode-to-cathode distance to be adjusted frequently to the most economical space without interrupting the cell current.

The chlorine released at the bottom of the anode escapes through slots in the graphite, thus permitting the chlorine to pass rapidly to the upper surface of the anodes.

The decomposer is a vertical tower filled with graphite packings. This provides a very short anode-to-anode distance, an important consideration for efficient decomposition. The tower is flooded with amalgam which enters at the top; pure water is introduced near the bottom and forces its way upward in a very thin film between the amalgam and graphite surfaces.

Among the advantages claimed for this cell, compared with existing European equipment, is the presence of calcium sulphate in the brine (from rock salt or evaporated salt) can be tolerated in the Mathieson process, thus avoiding the necessity for removal with barium carbonate; it requires only 60 per cent of the floor space needed for the European horizontal cell; the anode construction of the Mathieson cell gives a lower energy consumption by about 15 per cent at equal current densities.

Little Maintenance

The rates of flow of brine, amalgam and water are regulated to produce a 50 per cent caustic solution in the decomposer. Very little maintenance is required.

Present recommendations are for a current density of 2.5 amperes per square inch; current efficiency is credited at 95 per cent. The amalgam can be kept free of impurities by skimming its surface. The electrolyser is provided with an end box, having a removal cover for this purpose.

Aluminium Production in Norway

The first part of the large State-owned Ardal aluminium works, with an annual capacity of 12,000 tons of aluminium, is expected to be in operation by the beginning of next year. The works are to be the largest in Norway and will have a total capacity of 24,000 tons, thus increasing the country's total productive capacity to about 50,000 tons. A large part of this output will be shipped to world markets.

Celluloid Dolls from Germany Again.—The Rhenish Rubber & Celluloid Works at Mannheim-Neckarau have received export orders totalling $500,000. Sweden and Switzerland have ordered $300,000 worth of dolls and first deliveries will be made soon. Contracts with Belgian and Dutch firms provide for exports valued at $200,000. Licences have yet to be granted. The firm of Meise & Möcking A.G. at Wuppertal, British Zone, manufactures scales, lids, boxes and cases from celluloid and "Cellon." It specialises in containers and lids for the chemical and pharmaceutical trades.

THE COMMERCIAL SEPARATION OF ISOTOPES

by FRANK RUMFORD, Ph.D., F.R.I.C., M.I.Chem.E.

MOST chemical elements are known to consist of mixtures of isotopes, or atoms of varying atomic weight, but identical, or nearly identical, chemical behaviour. Isotopes owe their existence to variations in the weight of the atomic nucleus, with a constant nuclear charge and constant arrangement of electrons in the outer atomic structure.

Until recently, the commercial importance of individual isotopes has been small, but since the development of atomic energy the situation has changed completely. The isolation of U^{235} and the preparation of heavy water were vital stages in the early work, as described[1] in the Smyth Report, and may still play an important part in power generation by atomic piles.

Again, the new elements appearing as a result of atomic disintegration may be isotope mixtures of which one member is of outstanding importance. In these circumstances, it seems certain that isotope separation on a commercial scale will be widely practised in the immediate future.

Varying Methods

A number of established methods of separation may be used, depending on (a) different atomic mass; and (b) different physical or chemical properties.

If for any mixture of isotopes a single process of separation is carried out, then the "separation factor" R, for any one component may be defined as the ratio of concentration of that component before the operation to the concentration afterwards. It is often convenient to use for such operations the term "enrichment factor" E, defined as (R – 1). In a typical process, that of gaseous diffusion, the rate of diffusion is proportional to the square root of the gas density and for two isotopes of mass D_1 and D_2 the ideal value for R would be $\frac{D_1}{D_2}$. This rate would only obtain for the first traces of gas passing the diffusion membrane, and for a process in which half the total amount of gas diffuses, the actual enrichment factor will be only 0.69 (R – 1), where R has the ideal value given above.[2] Clearly the lower the enrichment factor, the greater the number of stages required in order to bring about a given degree of separation.

Considering the system in which a mixture of two gases, of molecular masses M_1 and M_2, are separated from another space at lower pressure by a porous diaphragm, it follows from the kinetic theory that the mean molecular velocities V_1 and V_2 are to each other in the ratio of the square roots of the molecular masses, or the molecules of the lighter gas M_1 will strike the barrier at a rate $\frac{M_1}{M_2}$ times as fast as the heavier molecules, provided that equal numbers of each gas are present in the original mixture.

The ideal porous diaphragm would pass all molecules striking it, but would contain no passages large enough to admit of mass flow of several molecules at a rate proportional to the average density of the gas mixture. This condition requires that the barrier should contain no holes larger than about one-tenth of the mean free path of the gas molecules. At atmospheric pressure, this path is one of the order of 0.1 microns, so that the barrier holes should be of the dimensions corresponding to 0.01 microns.

To increase the allowable size of aperture, it would be necessary to reduce the total gas pressure, while an increase in the pressure in an endeavour to increase throughput will only make the diaphragm less selective. For maximum throughput, the holes should be as numerous as possible, and should not clog up—the gases must be dust free—or corrode in any way. If the simplest arrangement of pressures is required, then one side, preferably the high pressure side, of the diaphram must be maintained at atmospheric pressure, and the apparatus must be strong enough to withstand pressures of the order of one atmosphere.

Many Stages of Separation

As the enrichment factor when dealing with isotopes will usually be small, the separation will need a number of stages, with the stream enriched in one component passing counter-current to the stream enriched in the other. Where one half of the total gas present in each stage passes through the membrane, which would appear to be the most suitable arrangement, the enrichment factor for two gases of masses D_1 and D_2 will be $0.69\left(\sqrt{\frac{D_1}{D_2}} - 1\right)$ where D_2 is the lighter molecule. In the classic case of the separation of the uranium isotopes in the form of the hexafluorides, the relative masses were as 352 to 349, and the value of the enrichment factor 0.003. In ordinary uranium, the concentration of U^{235} is 0.7 per cent, which suggests that at least 1650 stages will be required in order to obtain a product of 99 per cent purity.

These stages will be arranged somewhat on the lines of Fig. 1. Here R_1, R_2, R_3—represent successive stages, with the gases passing the diaphragms d_1, d_2, d_3—being boosted by the pumps P_1, P_2, P_3—while mixing with the "reflux" gas stream from the stage in front. Where such a large change in concentration is required it will be necessary to handle large quantities of the original mixture in order to give any reasonable amounts of the more concentrated gas. The size of the stages necessary when only the U^{235} is required will become steadily less, and the system may be compared with a series of fractionating columns working on almost total reflux, with the relatively small quantity of product from each column forming the feed for the next in series.

A Typical Example

No data are available for the quantities actually circulated in the actual plants, or for the rate of flow through the diaphragms, although the operation was on a very large scale.[3] It is of interest to speculate on the much simpler case of the separation of deuterium from ordinary hydrogen. Here the ideal separation factor is $\sqrt{2}$ and the enrichment factor for a 50 per cent gas passage 0.286, which suggests some 35 stages, in passing from 0.02 per cent up to 99 per cent of deuterium. For an output of 1 lb. mol, or 4 lb. of deuterium per day, the amount of gas to be handled in the first stages will be 75,000 cu. ft. per hour, and nearly the same volume will pass through the diaphragm in the first stages, following the flow lines of Fig. 1.

If an arbitrary flow rate of 1 cu. ft. per minute per sq. ft. of diaphragm is assumed, then the total diaphragm area in this stage will be 1250 sq. ft. The area required in later stages will be much smaller, but, assuming a mean value for all stages of 625 sq. ft., a total diaphragm area of 22,000 sq. ft. will be required. If it be further assumed that a pressure drop of 7 lb./sq. in. is incurred in passing the barrier of the first stage, then the power consumption will be about 50 kWh, and a total power requirement of the order of 2000 kWh may be expected.

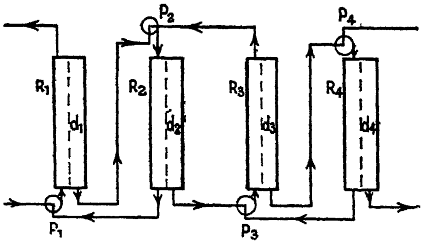


Fig. 1. Arrangement of diffusion stages

It will be seen that this, the simplest of all isotope separations, still involves a great deal of plant and power. Nevertheless, a diffusion plant of this kind was used for the separation of the uranium isotopes, even though as low a figure as 0.0014 has been quoted for the enrichment factor actually obtained. It is unfortunate that the hexa fluorides are the only readily available gaseous compounds of uranium, as they are chemically reactive and rapidly attacked by water.

The nature of the diaphragm is not known, and any comments are pure speculation. although Smyth mentions an etched silver-zinc sheet. If porous earthenware diaphragms are used, of considerably smaller pore size than the normal commercial types, then they could most easily be assembled as tubes in headers, as shown in the purely speculative form of Fig. 2. The necessity for absolute vacuum tightness in the plant was apparently met by building with such materials as pyrex glass fused together at joints.

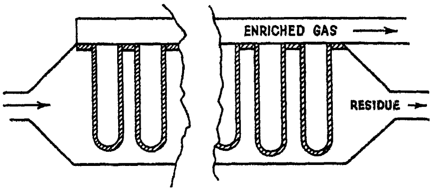


Fig. 2. Diffusion unit: suggested design

Alternative Method

An interesting variation on standard diffusion methods which may be of use in the future introduces a third component, such as steam, with only a light membrane through which all components may pass. Then the two compartments of the diffusion cell are maintained at the same pressure, but one is filled entirely by steam in the initial stages. Then the two isotopes will diffuse into the steam-filled cell at different rates, though these will differ less than with the simple fine pore barrier. The only advantage over ordinary diffusion is that the special diaphragm is dispensed with. G. Hertz carried this method to its logical conclusion and used mercury vapour in a diffusion pump as a "membrane" into which diffusion occurred, but the method demands very high vacuum and is hardly likely to be useful in this form.

This phenomenon, caused by convection

currents in fluids, tends to concentrate groups of molecules of greater or lesser weight in certain zones of the system. Thus, when a hot wire is stretched in the centre of a gas-filled tube, the lighter molecules tend to concentrate at the top of the tube. In the classic experiments of Clusius and Dickel[4] an arrangement of five tubes in series, with a central platinum wire in each heated to 600°C., gave a 'heavy" hydrogen chloride containing 99 per cent of HCl^{37} and a light product containing 96 per cent of HCl^{35}. The energy requirements were very high—of the order of 10^4 kWh per gram of isotope separated.

The method is applicable to liquids and the plant is very simple at first sight, consisting only of three concentric tubes, with steam in the innermost, water in the outermost, and a thin liquid annulus in between. These may be erected in stages as for gaseous diffusion, and should demand much less power for pumping and make up to a much more compact plant. It has been found, however, that the central tubes must be very accurately centred, while the rate of production is very small compared with the amounts of steam required.

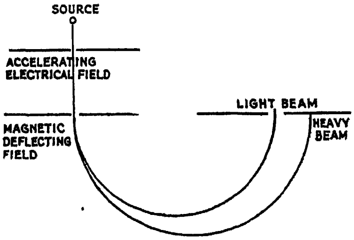


Fig. 3. The effect of the magnetic field on the molecule stream

As the liquid thermal diffusion plant reduces to a series of fairly efficient condensers, the high steam usage is not surprising, and it seems that gaseous thermal diffusion is much more economical, even though the compactness of the plant disappears. Thus, for a plant to separate 100 grams of C^{13} per day, in concentration of 90 per cent, from natural methane, it is suggested by Benedict[5] that a hot surface of 26,000 sq. m. and a heat input of 7500 kWh will be required. The surface will be divided into about 9000 columns of 6 in. in diameter and 20 ft. high.

Electro-Magnetic Separation

This may be termed the classic method of isolating isotopes. As will be remembered, it is based upon the mass spectrograph, in which a narrow stream of ionised molecules is accelerated to a high kinetic energy and then bent by a magnetic field in a curve, the radius of which is determined by the masses of individual molecules (Fig. 3).

Unfortunately the individual ionised molecules represent a very small yield for the plant and energy employed. The process demands high vacua, high voltages, and intense magnetic fields; it is necessary to separate isotopes bearing a single electron charge, and heavier charges represent wastage, while the entry slots are narrow, and any attempt at widening means a lower separation factor. In the projects for the separation of uranium isotopes enormous magnets—cyclotron units—were used, but it is doubtful if these could be contemplated in more normal practice.

A possible development which may overcome some of these disadvantages is described by Smyth. A supply of ionised molecules from a wide slit is accelerated as before and then exposed to a further electrical field varying at radio frequency. This causes "bunching" of the ions in clusters, and each of these clusters divides into a light and heavy group travelling at different speeds. Then, at a suitable point in the path, groups of light isotope arrive first, followed by a heavy group. A further synchronised electric field can then be set to deflect each alternate cluster.

The scheme is claimed to work in the separation of lithium isotopes, and would avoid the use of the enormous magnets, although high vacua and complicated electric fields are still called for. The wider beam of charged molecules would give a higher throughput than in the standard mass spectrograph. Despite these advantages, it is doubtful if such a process will ever be used in the bulk production—up to pounds in weight—of typical isotopes.

Centrifugal Processes

Under the influence of very high centrifugal effects—up to 200,000 times the force of gravity—mixtures of light and heavy molecules in fluids tend to separate into light and heavy fluid layers. The separation is proportional to a function of the difference between the molecular weights, instead of the more usual function based upon the ratio of the respective weights. This makes the centrifugal method more attractive for the

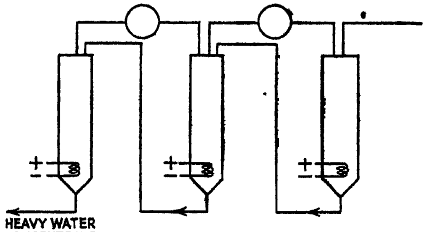


Fig. 4. Heavy water concentration. Electrolytic-chemical exchange

separation of isotopes of high atomic weight, as will be seen by comparing the separation factors for carbon and uranium isotopes. By diffusion, the relative factors are $\sqrt{\left[\frac{13}{12}\right]}$ and $\sqrt{\frac{238}{235}}$, or 1.04 and 1.007; by centrifuging the factors are a function of 1 and 3 respectively.

A gas centrifuge system for heavy molecules presents a notable advantage, therefore, but it will be appreciated that the very high centrifugal effects required make construction difficult and power consumption very high. Little has been published on this type of plant but Beams and Skarstrom[6] have described a concentric tube centrifuge with an outer radius of 4 in., some 11 in. long, giving a centrifugal force of 170,000 g. This, for carbon isotopes, gave an enrichment of 0.0195, while to produce some 100 grams a day of 90 per cent purity C^{13} would require about 19,000 centrifugal stages[5]. Power requirements would be very large, as it is estimated that each centrifuge would require 1 h.p., or perhaps 20 kWh per day, to drive it.

If it were possible to design larger centrifuges with the same centrifugal effect, and these were so designed as to diminish frictional losses to a marked extent—two very difficult problems—then centrifugal separation might become a process comparable with diffusion or chemical exchange.

Chemical Exchange

All chemical differences must be small, by the definition of an isotope, but, nevertheless, they exist and, as would be expected, are most marked with hydrogen and deuterium. Thus, when water is being decomposed by electrolysis, the residue grows steadily richer in heavy water. This may be due to several reasons, such as ionic discharge rates, or to the important exchange reaction: $H_2O + HD = HDO + H_2$, in which the normal equilibrium leaves between three and four times as much deuterium in the liquid as in the gas phase.

Whatever this may be, it has been found possible to increase the concentration of heavy water up to 90 per cent by a decomposition of water amounting to a volume decrease of 100,000, *i.e.*, 1 ml. of water from 100 litres. In commercial production, this process is improved by working in stages as in Fig. 4, and washing the products of electrolysis with water from the previous stage. As with diffusion, the stages are largest at the water feed end and smallest at the D_2O end, while catalysts have been used to increase the rate of exchange.

Such a system lends itself to thermal economy, and the use of hydrogen as fuel for power units, and it should be possible to cut down very considerably, the large amounts of power required by "straight" electrolysis.

This chemical exchange between liquid and gas is typical of other isotope separations, and has been used to concentrate the heavy forms of carbon, nitrogen and sulphur. Thus, if when HCN gas flows counter current to sodium cyanide solution, the vapour becomes enriched in heavy carbon—C^{13}. At the bottom of the column, the sodium cyanide is decomposed by sulphuric acid to regenerate HCN gas, while at the top the gas is absorbed in caustic soda solution. Small proportions of both top and bottom products are drawn off to give concentrate and denuded fractions, and these pass to the next tower of the series, up or down according to the normal countercurrent system.

The ratio of C^{13} in the gas to liquid concentrations appears to be about 0.987. For nitrogen and sulphur, the systems are ammonia-ammonium nitrate, and sulphur dioxide-sodium bisulphite, respectively. The number of mols. of material flowing per mol. of heavy isotope varies from 2000 to 10,000. In terms of distillation practice, this would correspond to a "reflux ratio" of from 2000-10,000 to one, but the simple heat input is replaced by chemical input, in the form of sulphuric acid and caustic soda or similar reagents. These are much more costly than heat, and can probably only be justified when a high enrichment factor can be obtained.

As this is essentially caused by chemical differences, and as these, by definition, are small, it is not likely that chemical exchanges will prove very popular. As a rule the size of the column in which chemical exchange occurs is determined by the normal rules for mass exchange between liquid and gas, and the column will be equivalent to the same number of transfer units or theoretical plates as in distillation or gas scrubbing.

Certain differences in chemical behaviour have been noted[3] in the interaction of alkaline earth salts and zeolites. These bodies, working on a base exchange cycle, are widely used in water softening, and they appear to have some separating effect with isotopes of nitrogen, lithium, and potassium. It is probable that a number of other small chemical differences remain to be discovered, but whether they will be any more effective than the liquid-gas equilibria is doubtful.

Difference in Vapour Pressure

The technique of dealing with small differences in vapour pressure has long been established in industry, and fractional distillation, with multiplate fractionating columns, working on high reflux, are

(*Continued on page* 238)

Patent Law in the U.S.S.R.

Sweeping Powers for Government Committee

THE extraordinary disparity between patent law in Russia and in the Western World is underlined by the reappointment with wider powers of the Soviet Committee for Inventions and discoveries.

The present patent law in Russia was promulgated by decree of March 5, 1941. The committee reappointed to administer it has to take the initiative in and accelerate general development of new inventions; to maintain close liaison with the various ministries and departments through whom inventions and discoveries come to light, and control the activities of these departments in regard to inventions. The last includes the applications of new patents to industry, financial and other assistance to inventors, ensuring secrecy, remedying complaints or abuses; and granting patents and authors' copyrights.

Although there is, under existing Soviet law, an Inventions or Patent Office, its duties would appear to come largely under the control of the new committee which apparently has the power to grant patents and certificates, as well as to afford assistance to inventors in the form of both legal and technical advice.

Chemical Products Barred

The Russian patent law of 1941 deals with inventions, technical improvements, and rationalisation proposals or suggestions from factory workers. Under these various categories either patents or authors' certicates may be granted. Patents may not be issued for chemically obtained products but only for methods, both chemical and non-chemical. Authors' certificates are granted for medical, gustatory, and food products prepared by other than chemical means. An inventor may request either recognition of his invention, in which case an author's certificate is issued; or exclusive rights therein, for which a patent would be granted. A clause is included whereby patents or certificates can be given only for inventions that can be used industrially. (This term must be interpreted widely.) Where certificates are granted the invention belongs to the State which undertakes development, but the inventor receives some remuneration. Certificates only are granted in respect to inventions arising out of the innovators' daily work in laboratories or State institutions.

The various State organisations through whom inventions applications may be lodged are bound by law to prepare special estimates of costs and remuneration, preparation of models, maintaining experimental stations, tests and so forth.

The term or life of a patent is 15 years from date of application. Persons or corporate bodies using an invention in the U.S.S.R., or who had made preparations to do so, independently of the inventor, may continue to do so, under certain conditions; and a patent may apparently still be granted to the inventor, despite this prior user. Special agreements are made with inventors in regard to patents of State interest, and failure to agree may result in compulsory licensing. Applications for patents and certificates are published in the *Inventions Bulletin* and are subject to objection within three months. *The Bulletin* is published by the office which also undertakes international exchange of patent materials.

The amendment of November, 1942, contains further rules as to remuneration for suggestions made in factories, by directors, managers and workpeople, including calculations as to estimated savings effected by such improvements or rationalisation proposals. Distinction is made in this case between technical and organisational suggestions.

Official Notice

Quinine Control Ended

QUININE and quinine salts and other cinchona bark products are in very satisfactory supply, states a Board of Trade announcement, and there is no longer need to continue control over their supply in this country. An order revoking this control (from July 27) has been made. For the time being, export control will be retained on quinine, quinidine, cinchona and other salts. This is to ensure that the relatively small quantities of these drugs needed for essential purposes are available in the unlikely event of a future shortage.

The Order concerned is S. R. & O., No. 1553 of 1947, entitled the control of Cinchona and Cinchona Products and Synthetic Substitutes (No. 3) Revocation Order, 1947. (H.M.S.O., 1d.)

Seaweed and Vegetable Oils

The Eire Research Council in their report for 1945-46 deal with investigations into the chemical composition and the industrial possibilities of seaweed. With a view to ascertaining the possibility of increasing the output of certain seaweeds, particularly the laminarians, an investigation was commenced during the year as an extension of the survey of marine algae into the factors affecting growth.

"The question of carrying out investigation into the production of oil from Irish-grown plants has been under consideration for a number of years," says the report.

I.L.O. Industrial Committees

U.K. Metal Representatives

TWO of the seven international committees set up by the governing body of the International Labour Office to deal with conditions in major industries will hold their second sessions shortly. The Iron and Steel Committee will meet on August 20, and the Metal Trades Committee on September 2; both meetings will be held in the Parliament Building, Stockholm.

The following have been nominated to attend these meetings as representatives and advisers from the United Kingdom:

Iron and Steel Committee

Mr. S. G. Holloway, assistant secretary, Ministry of Labour and National Service; Mr. T. Stanes, assistant secretary, Ministry of Supply (Iron and Steel Board); Colonel J. M. Bevan, chairman, Briton Ferry Steel Co., Ltd.; Mr. R. Mather, chairman, Skinningrove Iron Co., Ltd.; Mr. R. Ross, president, Iron and Steel Trades Employers' Association; Sir Lewis Jones, secretary, South Wales Siemens Association; Mr. Ambrose Callighan, member of the General Council of the Trades Union Congress; general secretary of the National Union of Blastfurnacemen, Ore Miners, Coke Workers and Kindred Trades; and Mr. Lincoln Evans, member of the General Council of the Trades Union Congress; general secretary of the Iron and Steel Trades Confederation.

Metal Trade Committee

Mr. M. D. Tennant, assistant secretary, Ministry of Labour and National Service; Mr. W. K. Ward, principal, Ministry of Supply; Mr. R. R. Bowman, Permanent Secretary, Ministry of Labour and National Insurance, Government of Northern Ireland, will accompany the Government representatives; Mr. A. Collie Low, secretary, Engineering and Allied Employers' Federation; Mr. W. Watson, secretary, Shipbuilding Employers' Federation; Mr. Robert Openshaw, member of the executive council of the Amalgamated Engineering Union; and Mr. T. McKinney, president, United Society of Boilermakers and Iron and Steel Ship builders.

Home Office and Nitrate Risks

The probability that an interdepartmental committee will be set up "to consider the risks accompanied with the movement of ammonium nitrate" is forecast by the Explosives Department of the Home Office.

U.S. Conserving Scrap

Heavier Charges of Iron Ore

IN order to maintain steelmaking operations at the highest level in spite of shortages and deteriorating quality of iron and steel scrap, operating men of the steel industry have devised means of using more iron ore in the open hearth process, according to the American Iron and Steel Institute. Only enough iron ore was normally charged into the open hearth to promote chemical reactions, the amount of ore varying according to the quality and grade of steel being made. The quantity of iron recovered from such use of ore was always looked upon as incidental and unimportant.

Now, however, additional quantities of ore are charged into the furnace in order to recover the iron content. Up to 13 per cent of the weight of purchased scrap has been replaced by the iron derived from iron ore. In using iron ore in this fashion, high-grade lump ore is necessary and about one pound of coke must be charged for every three pounds of ore in order to promote the necessary chemical reactions. Because of the additional quantity of cold materials charged into the furnaces the time necessary to manufacture a heat of steel is increased by about 4 per cent. Operations otherwise are normal.

The shortages of scrap have forced some steel companies to use larger proportions of molten pig iron (often as much as 70 per cent of the total charge) at certain times in recent months. Under normal operating conditions about half of the charge is hot metal and the balance is scrap.

Meanwhile, high operating rates of the industry's blast furnaces have resulted in maintenance of a good volume of shipments of iron to non-integrated steel producers and to foundries. In January, 1947, the 90.8 per cent blast furnace operating rate equivalent to 5,014,796 net tons of pig iron, was accompanied by merchant iron shipments of 671,257 net tons. The latter total was larger than shipments in any month of 1946, and the monthly average in all years since 1929, except in two war years, 1942 and 1943.

Tar Manufacture in Eastern Germany.—The Büscher & Hoffmann A.G. at Halle/Saale—one of the industrial plants transferred lately to the ownership of the provincial Government of Saxony-Anhalt—has resumed the manufacture of tar and bituminous products as well as protective materials for the building trade. When adequately supplied with raw materials, the firm is able to produce 250,000 sq.m. of roofing-felt a month. Output during the first six months of 1946 amounted to nearly 1,000,000 sq.m.

COMPANY MEETING

Benn Brothers, Ltd.

Paper Control and the Trade Press

THE fifty-first annual general meeting of Benn Brothers, Ltd. (proprietors of THE CHEMICAL AGE) was held at Bouverie House, Fleet Street, London, E.C.4, on Friday, August 8, with Mr. Glanvill Benn, chairman, presiding.

Moving that the published report and accounts for the year ended June 30, 1947, be accepted and approved, and that the dividends as announced be paid on August 15, Mr. Benn said: "It is the natural history of publications, as with all other forms of life, to be born, to live and eventually, like old soldiers to fade away. Since 1939, however, an amateur magician, known as the Paper Controller, has attempted to arrest the processes of nature.

Artificial Conditions

" The effect of his orders and regulations has been to freeze the publishing industry at below its 1939 level. In consequence many a periodical which ought long since to have died, continues in the absence of normal competition to exist, while, on the other hand, many a new journal which ought to be serving new aspects of industry remains still unborn—because you cannot establish a worthwhile journal with the statutory ration of 8 cwt. of paper. And, perhaps more important of all, many a vigorous, well-established journal, which ought to expanding rapidly, remains stunted, unable to accept new readers or to accommodate new advertisers.

" The Benn Brothers journals are in this latter category. *The British Trade Journal* is now 84 years old and wholly concentrated as it is on the development of our export trade, is allowed some strictly regulated growth. But for the Paper Controller that growth would be a good deal more rapid. *The Hardware Trade Journal,* not allowed to expand itself, has produced a Register of Merchant Shippers exporting hardware to all the countries of the world which has proved invaluable to traders.

" In mentioning these particular journals I do not wish to imply any invidious distinctions. Without exception all the Benn journals are healthier and more vigorous than ever, and would be growing more rapidly if only we were allowed more paper. But it is not only our journals that are affected; every branch of trade and industry is concerned. Thousands engaged in the productive industries of the country are being starved of the opportunity of obtaining the vital information they need, week by week, at the very time when the Government itself is calling for more production from all sections of industry.

" The industries we serve are themselves all short of raw materials, hence the scarcity of goods in the shops and the much discussed austerity. The shortage of paper, the raw material of our industry, means shortage of news and information. Austerity for the body is bad enough, but atrophy of the mind is far more serious.

" For eight years and more supply has notably outstripped demand in one field of activity only—that is in the manufacture of governmental orders, regulations and controls. The Bank of England and coal have been nationalised, and gas, electricity and transport are in a state of suspended animation awaiting the dead hand of State control. The result of this misplaced manpower, brains and energy, to say nothing of wasted paper, is that to-day the individual workman who does odd repair jobs is better paid than the builder of houses: the farmer gets a better price by selling his grain on the grey market as chicken feed than at the official rate to the miller.

" There is, perhaps, some glimmer of hope. Already our planners appear to be beginning to realise that the restoration of incentives is essential if folk are to work with a good heart. Our present rulers have not yet had the courage to confess the error of the doctrines they have preached for so long, but if they are now willing to admit that incentives are necessary, it may not be long before they recant their former heresies and preach the virtues of the profit motive and the continual democratic plebiscite which a free market involves."

The Wider View

Sir Ernest Benn, Bt., seconding the resolution, said the year under review had seen more foreign travel by members of the board of directors than any year in the company's history. He welcomed the new trend and hoped that the practice would be developed, and perhaps extended to some of the senior editors and managers. It is very important that people like ourselves should go abroad and imbibe information and inspiration from a wider view of affairs, not only because of the interests of this company, but because from a national point of view we must once again resume our natural position as the nerve centre of world trade and commerce.

The resolution was carried unanimously.

The re-election of Mr. K. E. Hughes as a director of the company was moved by Miss E. Bartlett, seconded by Mr. A. J. Knivett and carried unanimously.

A vote of thanks to the staff was carried on the proposal of Mr. John Benn to which Mr. Walter Vesey replied.

COMMERCIAL SEPARATION OF ISOTOPES

(*Continued from page* 234)

common. However, the separation of isotopes may present a most difficult problem. It may be calculated that a column of more than 200 plates, working with a reflux ratio of 1000 to 1, will be required to increase the concentration of D_2O from 0.02 per cent up to 1 per cent, and a further column of the same height and operating characteristics to raise this to 99 per cent. It would thus be necessary to boil up at least 60,000 pounds of water in order to remove one pound of concentrate from the base of either column, giving a minimum total consumption of 120,000 pounds of steam per pound of heavy water produced. These quantities might be reduced by the aid of special recompression units, or by utilising the methods of multiple effect evaporation, but remain a very substantial charge, and this for the simplest isotope separation. The columns would be very long; it is doubtful if any commercial columns of more than fifty theoretical plates are being operated as single units, although certain laboratory columns have been devised to give very high plate numbers in a comparatively small height. Thus, Dostroovsky and Hughes[9] describe a packed column 12 feet long and an inch or so in diameter, equivalent to some 450 plates when working on this problem of heavy water.

Distillation appears to be an economic method of obtaining heavy water, but the low separation factors indicated for other isotopes have so far proved a barrier to wider exploitation. It may be noted that distillation effects in the chemical exchange system for deuterium aid in the concentration of D_2O at the base of the column.

In ordinary distillation, it has often proved possible to accentuate differences in vapour pressure by the addition of another component—azeotropic or extractive distillation—but there is no evidence that these methods have proved successful in the case of isotopes. As they depend upon chemical differences between the two original components, this is not surprising. As a general rule, differences in vapour pressure increase as the total pressure is lowered and this would suggest that the methods of " molecular distillation " may be applied to isotope separation. So far, however, no satisfactory methods for operation in stages—fractional molecular distillation—have been devised. The standard spinning disc system is complicated enough without being used on the scale required in a cascade.

Summary

The actual processes that have been operated for separation of isotopes in amounts of the order of gram molecules and upwards are those of chemical exchange, thermal diffusion, gaseous diffusion and distillation (only in the case of deuterium). To these may be added, perhaps, the gas centrifuge system. A comparison between the four more universal systems has been given by Benedict[5], and is set out in Table 1.

In view of the very large amounts of plant required, it appears that the ideal process has not yet been hit upon. Perhaps a development of distillation, or the preparation of a greatly improved diaphragm for gaseous diffusion may enable considerable economies to be made. The problem is a fascinating one for chemical engineers and it is probable that much attention will be paid to it in the immediate future.

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[4] *Naturwiss*, 1938, 26, 546.
1939, 27, 645.
[5] *Trans. Amer. Inst. Chem. Eng.*, 1947, 43, 41.
[6] *Phys. Rev.*, 1939, 56, 266.
[7] Urey et al, *I. Chem. Phys.*, 1940, 8, 532.
[8] Urey, *Ind. Eng. Chem.*, 1937, 29, 531.
[9] *Nature*, 1946, 158, 164.

TABLE 1
For the preparation of 100 gms. of C^{13} per day

Process	Enrichment Factor	Stages or Plant	Energy or Chemical Requirements
Chemical Exchange	0.013	1000 plates	2 tons NaOH 3 tons H_2SO_4
Thermal Diffusion	0.0051	9000 columns	7560 kWh.
Gaseous Diffusion	0.043	2600 sq. m. 345 stages	149 kWh.
Gas Centrifuge	0.0195	19000 centrifuges	

All figures are based on minimum requirements for production of 90 per cent. pure product, in a 50 per cent. yield from natural carbon compounds.

Austrian Oil Cracking Process

The only up-to-date cracking plant in Austria, at Schwechat near Vienna, at present obtains 25 per cent of petrol from the oil of the Zistersdorf Reservoir. This process leaves a considerable waste that can be used only as inferior fuel oil. Gustav Kroll, an Austrian chemist, has now developed an electrocatalytic cracking process which can not only be employed much more economically and efficiently than the high-pressure method at present in use, but may possibly permit as much as 40 per cent petrol, 25 per cent paraffin oil and 20 per cent diesel oil to be obtained.

CHEMICALS IN SOUTH AFRICA

For the first time, the Price Controller has fixed maximum prices of boot, shoe, and floor polishes. The increased prices are due to the higher prices of raw materials and packing. Maximum prices of lead-acid type batteries manufactured in the Union have been fixed at from £5 3s. to £10 3s. each.

* * *

Mossel Bay, one of the world's largest exporters of extract of aloes, is at the height of the tapping season, which is shortly before the plants are in full bloom. The spiny leaves are cut and stacked in piles in the open in such a way that the thick yellow oil from the veins flows into skins arranged in hollows in the ground. The extract is subsequently distilled to concentrate the extract which then becomes a solid resin-like mass ranging from dark brown to almost black in colour.

* * *

The establishment of a new factory in Durban for the manufacture of industrial paint and varnish products not at present made in South Africa with possibly another factory at Port Elizabeth to meet the special requirements of the motor industry, and other expansion in various centres of the Union to follow, is to come about as the result of important agreements between Herbert Evans & Co., Ltd., and Pinchin, Johnson & Co., Ltd., of London.

* * *

The latest production statistics recently issued by the Department of Mines, and relating to base minerals in 1946, show a decrease in coal and asbestos, but substantial increases in manganese and chrome. The following figures in short tons compare with output in the previous year (in brackets), coal 26,016,307 (25,964,285); asbestos 20.225 (28,216); manganese 262,238 (126,266); chrome 233,970 (109,299). The value of exports of chrome increased from £424,000 to £608,000, copper from £1,302,000 to £1.692,000 and manganese from £389,000 to £905,000.

U.K. Light Metals Statistics

Production in May (long tons) was:—

Aluminium Production: Virgin and secondary ingot (together) 7748.

Aluminium Scrap Arisings: Arisings, arisings percentage segregated, and consumption (together) 20,393.

Aluminium Fabrication: Sheet and strip, foil, extrusions, castings, and forgings (together) 16,986.

Magnesium Fabrication: Sheet, extrusions, castings, and forgings (together) 178.

POPULAR GREEN

When 1000 people were offered a choice of soaps in a wide variety of colours, 70 per cent chose green. So that is the colour of a new fatless coupon-free synthetic household tablet shortly to appear in the shops. The Ministry of Food has granted a manufacturing licence to a soap research firm, and an early output of half a million tablets a week is the target. Mr. Edward Shamash, chemist, who developed the product, states: "The substitute's cleansing efficiency is four times greater than that of ordinary soap, and it lathers better." A soluble plastic which binds the ingredients together is said to be one of the secrets of the new soap.

Lloyd's Class 1 Certificate

Whessoe, Ltd., manufacturers of welded pressure vessels for liquid and gas storage, advise that their name has been placed on the list of recognised manufacturers of that type of equipment by Lloyd's Register of Shipping, and a Class I Certificate has been granted to that effect.

It is a significant fact that there are in the entire world only about two dozen firms so recognised by Lloyd's. That half of them are British pays tribute to the high standard of engineering technique and workmanship achieved in this country.

Misnomer

Although the Dyestuffs Division, I.C.I., is a designation familiar to all associated with chemical industry, the title is a misnomer. Only about 60 per cent of the division's output today is of dyestuffs. Almost as important in the seven factories with their 10,000 employees are now such products as rubber chemicals, synthetic rubber, synthetic resins and pest control products. This fact is made clear in "The Story of the Dyestuffs Division," published in the July issue of the *I.C.I. Magazine*, in which another interesting contribution is made by Sir Wallace Akers of the possible uses of atomic power.

Lead Shortage and High Prices

In the course of his address at the 16th annual general meeting of Goodlass Wall & Lead Industries, Ltd., Mr. Clive Cookson, the chairman, stated that there is an acute world shortage of lead, and that no new deposits of any size have been discovered in recent years. With regard to the prevailing high prices, Mr. Cookson took the view that their immediate effect might be to bring forward supplies that might otherwise not emerge, although in the long run, lead, compared with the other nonferrous metals might be relatively higher in price than in the past.

Home News Items

Philips Lamps Changes Name.—On September 1, 1947, Philips Lamps, Ltd., will change its name to "Philips Electrical Limited."

Change of Address.—The Head Office of New Metals & Chemicals, Ltd., have been moved to larger premises at 16 Northumberland Avenue, London, W.C.2, with adjoining warehouse at Craven Street. The new telephone number is Whitehall 0573.

Unwanted Chemicals. More than 10,000 tons of chemical warfare materials, regarded as unsuitable, or too dangerous, to be recovered for industrial use, were aboard the dismantled *Leighton* sunk last week in the Atlantic, 160 miles from Cairnryan, Scotland.

Clay Convention, 1947.—The Eighth Clay Convention, organised by the National Federation of Clay Industries and the British Ceramic Society, will be held at Scarborough from September 22 to 27 under the presidency of Mr. J. G. Johnston, president of the National Federation of Clay Industries.

Anglo-Jugoslav Trade Talks.—A trade mission from Jugoslavia is understood to be coming to this country shortly for the purpose of discussing extensive trading. It is suggested that the party will include M. Melentije Popovic (Foreign Trade Minister) and M. Stanislav Kopcok (Deputy Minister of Industry).

Industrial Safeguards.—M. R. E. Tugman, of Imperial Chemical Industries, Ltd., will provide one of the two papers on safety methods in American industry, which will form part of the Silver Jubilee Congress at Brighton of the Royal Society for the Prevention of Accidents, October 7-10. Mr. Tugman has recently been studying his subject in the U.S.A.

Steel Nationalisation Forecast.—Speaking at a trade union meeting in Motherwell, Mr. Alexander Anderson, Socialist M.P. for Motherwell, said that the iron and steel industry would definitely be nationalised and that the Bill was in draft form. In Scotland modernisation and centralisation of the existing plants were likely to take place in conjunction with new developments.

New Branch.—J. W. Towers & Co., Ltd., manufacturers of chemicals, laboratory and scientific equipment, announce that a new branch will be opened at 28 Bridge Road, Stockton-on-Tees, on September 1.

Rising Chemical Prices.—Wholesale prices of chemicals and oils were 18.6 per cent higher last July than in July a year ago. Comparison with 1938 wholesale prices shows an increase of 85.1 per cent—states the *Board of Trade Journal.*

Pitch and Tar Infections.—The number of industrial diseases reported in June under the Factories Act, or under the Lead Paint Act, amounted to 44. Twenty-nine of these cases were diagnosed as epitheliomatous ulceration (skin cancer), 28 being directly attributable to pitch (16) and tar (12).

World Need of Insecticides.—Sir John Boyd Orr, of the United Nations Food and Agricultural Organisation, told a conference of scientists in London last week, called by the F.A.O., that there was a good case for recommending Governments to give priority to producers of insecticides. Some 10 per cent of the world's harvests, he estimated, were lost through insects, fungi and rodents.

Steelworkers to Raise Output.—This week saw the introduction of an extended working week, including Sundays, at the cogging and plate mills of the Clydebridge Steel Works, Cambuslang. A works representative of the British Iron and Steel Confederation, stated that the men were meeting the employers' request, so as to produce an adequate supply of stock slabs and to make good tonnage lost in a recent mechanical breakdown.

I.C.C. Resolutions for U.N.O.—The resolutions adopted by the International Chamber of Commerce at its first post-war Congress in Montreux last June were on August 12 officially submitted for consideration in their final published form (I.C.C. brochure 117) to the Economic and Social Council of the United Nations. They were accompanied by a letter from the new president of the I.C.C., Mr. Arthur R. Guinness, to the Hon. Dewan Bahadur Sir Ramaswami Mudaliar, president of the E.S.O.C.

PERSONAL

Dr. E. C. Snow, who was formerly the Leather Controller, has been appointed director of the United Tanners' Federation.

Mr. R. E. Reed, chairman of A. Elder Reed & Co., Ltd., and a former chairman of the British Chemical and Dyestuffs Traders' Association, left £22,325 He died in March last.

Mr. Donald McMaster, formerly deputy chairman of Kodak, Ltd., London, has returned to the U.S. to take up his new duties as vice-president and assistant general manager to the Eastman Kodak Company, Rochester, New York.

Mr. D. P. C. Neave, managing director of Imperial Smelting Corporation, Ltd., has been elected a director of Fisons, Ltd., in succession to **Mr. L. B. Robinson**, who has recently accepted other appointments which will necessitate constant foreign travel.

Mr. C. G. H. Hallet has resigned from the board of the Ship Carbon Company of Great Britain.

Sir Geoffrey K. Peto and **Mr. C. W. Spiers** have retired from the board of Morgan Crucible Co., Ltd., to which **Mr. J. Walker** has now been appointed.

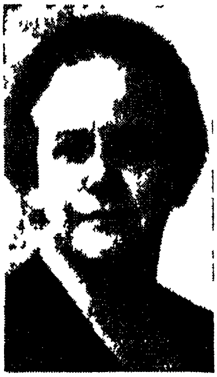
Society of Chem. Ind. Appointments

Mr. Reginald George, who was formerly general sales manager of Bell & Sons, Ltd., Liverpool, is to manage a new plant which Ortho Pharmaceutical Corporation of New Jersey, U.S., is establishing at High Wycombe, Bucks. Mr. George has just returned to this country to assume his new duties after spending several weeks in the United States observing methods and installations in use at the new Ortho plant at Raritan, New Jersey.

Mr. S. Thomson, a director and manager of the Lanarkshire Steel Co., Ltd., and **Mr. James Gibson**, manager at the Glengarnock Steel Works, have been appointed executive directors of Messrs. Colvilles, Ltd. **Dr. J. M. Ferguson** has been appointed works manager at the Dalzell Works, and **Mr. W. Gillies**, works manager, while **Mr. D. C. Wylie** has become plant manager at the Lanarkshire Steel Works. It has been decided to co-ordinate the management of the Dalzell Works and Lanarkshire Steel Works, and **Mr. S. Thomson** becomes general manager for both works.

Dr L. H. Lampitt has been re-elected president of the Society for a second year. The following have been elected vice-presidents: **Mr. H. W. Green**, and **Mr. E. M. Myers**. The four vacancies on the council have been filled by the election of **Mr. M. P. Balfe**, **Mr. E. E. Boake**, **Dr. W. H. J. Vernon**, and **Prof. E. C. Dodds**.

The American Chemical Society has announced that the Francis P. Garvan Medal honouring women in chemistry is to be awarded to **Professor Mary L. Sherrill**, head of the chemistry department at Mount Holyoke College, where she directed the investigations into antimalarial compounds.



Prof. Mary L. Sherrill

Dr. Louis Schmerling

Another A.C.S. award—only recently established and not yet conferred—is the 3000-dollar Ipatieff Prize in Chemistry. This is to be awarded to **Dr. Louis Schmerling** for his reactions of hydrocarbons.

Sir George Cunningham, Governor designate of North-West Frontier Province, Dominion of Pakistan, has resigned from the board of Attock Oil.

Obituary

Sir William Foot Mitchell, a former M.P., and at one time a director of Shell Transport and Trading Company, has died at the age of 88.

Shackleton Relic

A copper cylinder which had lain in the frozen wastes of McMurdo Sound, Antarctica for more than thirty years, has been found by the U.S. Navy and identified by a message which it contained, as a Shackleton relic. Of immense technical interest to metallurgists everywhere, the cylinder has been sent to the Copper Development Association where it is to be examined. Only on rare occasions does an opportunity present itself for investigating a metal object for so long exposed to the rigours of Antarctic conditions.

The cylinder, which is made from .022 in. sheet or strip copper, is 6 in. long, and has a diameter of 1¼ in.; it has a beaded edge at the open end, and a soldered seam down one side and round the bottom. Dr. F. Baker and Dr. E. Voce, the Association's chief chemist and chief metallurgist respectively, are supervising the examination.

Overseas News Items

Copper Mine Strike.—Workers at the Mosaboni mines of Indian Copper Corporation commenced a lightning strike on July 29.

Tanning Materials in Western Germany.—The cellulose factory Waldhof at Bensheim, U.S. Zone, is now producing various tanning materials. The firm is well known for the manufacture of cellulose, paper, yeast, alcohol, caustic soda and charcoal, but has not hitherto turned its attention to tanning materials.

U.S. Tyres and Wheels for Austria.—In order to relieve the existing scarcity of car tyres and wheels in Austria the U.S. occupation authorities have agreed to transfer 9510 used tyres and 600 wheels from U.S. army stocks to the Austrian Government for distribution in the U.S. Zone of occupation only.

Phosphate Discovery in China.—Deposits of phosphate rock, said to be capable of yielding 2,500,000 tons of fertilisers, are reported to have been discovered near Fengtai, Anhwei Province, China. A preliminary analysis by UNRRA chemists is understood to reveal that the rock compares with that used in the U.S.A. for the production of defluorinated tricalcium phosphate fertiliser.

Portent of Nationalisation.—Socialisation of all basic industries, including coal, oil and steel and chemicals, transport and power services, has been decided upon by the Schleswig-Holstein Landtag. Compensation will be paid to all not war criminals or Nazis. Former managers and owners will remain in charge as trustees until the measure "can be ratified on an all-German basis."

Sawdust Cement in Australia.—Sawdust Portland cement as a material for floors of buildings is one of the many innovations which Australia has designed to expedite building progress and to provide substitutes for materials in short supply. Information as to the suitability of sawdust for this purpose has been obtained during the last two years at the Forest Products Division of the Australian Council for Scientific and Industrial Research at Melbourne. Australian mountain ash (*Eucalyptus regnans*) has been found to provide the most successful sawdust. The addition of lime improves the setting qualities of the cement in the presence of sawdust, while calcium chloride has a very definite value as a setting accelerator. Although the introduction of sand results in a more robust and more easily laid mix, it reduces the good insulation properties.

Czech Scrap Metal Collection.—Scrap metal is being collected throughout Czechoslovakia during July and August in order to supply the country's industry with raw materials. Equipment left behind on the battle fields by the retreating German armies is particularly sought.

U.S. to Exhibit German Export Goods.—An exhibition of German export products is to be held in New York during the autumn. Items are to be shipped free of charge, but firms wishing to take part have to submit their products to the Joint Import/Export Agency for selection, since exhibition space is limited to a total of 2000 sq.m.

Fertilisers from Refuse. — Berlin's refuse, which yields valuable nutritive salts, is now being used to improve the sand-soil in the Grunewald and Jungfernheide districts. Slime obtained from the nearby Havel-Lakes and containing 40 per cent lime, 28 per cent humus components and more phosphates than horse-manure, is used for the same purpose.

Oil Refinery Protest to Soviet.—A protest has been sent by Lt.-Gen. Keyes, U.S. Commissioner in Austria, to the Soviet Commissioner, Gen. Kurasov, against the occupation by Soviet troops of the oil refinery at Lobau, owned jointly by the Anglo-Iranian Oil Co. and the Socony-Vacuum Oil Co., of New York.

German Specialists for Canada.—The first group of German scientists whose special skill will be made available to Canadian industry under a plan announced last autumn will be brought to Canada shortly. They are six scientists who, under terms of the order-in-council arranging for their entry, must possess specialised knowledge which will enable the establishment in Canada of a new industry or expansion of existing operations. Provision is also made for entry of "screened" research scientists and university professors.

Brazil Needs Soda Chemicals.—Because of curtailment of exports from the U.K. and the U.S.A., soda ash and caustic soda are the materials which Brazilian industries chiefly require at the moment. The soap, glass, textile and paper industries have been particularly affected, especially the soap and glass industries. Brazilian monthly requirements are approximately 3500 tons of caustic soda and 3000 tons of soda ash, but at present consumers are getting only about one-half of these amounts. The situation has led to speculation and extremely high prices for both materials.

Malayan Rubber. — Dealers' stocks of rubber in Malaya in June totalled 76,057 tons, of which 59,627 tons were Singapore rubber, states the Malayan Union Government in London. Port stocks represented a further 21,407 tons. Ocean shipments of sheet and crepe rubber in June totalled 60,870 tons, of which the U.S.A. received 39,347 tons, the U.K. 8156 tons and Canada 2833 tons.

Sweden and Austria to Resume Trade.—During the recent visit of an Austrian trade delegation to Stockholm the Swedish Minister of Commerce indicated that his country would welcome the resumption of old connections with Austria. Negotiations for the conclusion of a trade pact are believed to be impending. Austrian exports to Sweden formerly consisted of textiles and hats, metal alloys, magnesite bricks, machinery and instruments, while Swedish exports to Austria consisted of various ferrous alloys, tubes, ball-bearings and vacuum-cleaners.

U.S. Coal and Iron Ore.—According to a report from the U.S. Department of the Interior, ample coal and iron ore supplies, the foundation of U.S. industrial economy, are assured for "many decades." However, the United States has less than 25 years' supply of copper and petroleum. Due to war-time depletion of its mineral wealth, U.S. dependence on copper, zinc, lead, rutile, platinum and tantalum from foreign sources has increased substantially. Virtual self-sufficiency was assured for a long time in soft coal and lignite, anthracite, natural gas, magnesium, nitrates, phosphate rock, potash, salt and sulphur. Complete or virtual dependence on foreign sources with a possible expectation of improving the position through new discoveries can be said of chromite, ferro-grade manganese, nickel, platinum metals, tin, industrial diamonds, quartz crystal, and spinning quality asbestos. An improved position through new discoveries is expected on cobalt and flake graphite.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Increase of Capital

The nominal capital of **Norman Evans and Rais, Ltd.**, colour and chemical manufacturers, Manchester, 16, has been increased by £50,000, in 40,000 6 per cent redeemable first cumulative preference, 5000 7 per cent redeemable second cumulative preference and 5000 ordinary shares of £1, beyond the registered capital of £20,000. The capital now, therefore, consists of £40,000 6 per cent first preference, £15,000 second preference and £15,000 ordinary shares.

Company News

Sheffield Steel Products, Ltd., has reported a net profit for the year just ended of £90,157. A dividend of 15 per cent (less tax) is recommended.

Anchor Chemical Co. is to raise its ordinary interim dividend for the year ending November 30, 1947, by 3⅓ per cent to 13⅓ per cent. Warrants were posted yesterday.

Boots Pure Drug Company, Limited, have declared an interim dividend for the half-year ending September, 1947, of 10 per cent., less tax, to be paid on that date to ordinary shareholders on record on September 8, 1947.

British Glues and Chemicals, Ltd. announces a net profit of £217,827 for the year ended April 30, 1947. A final dividend of 20 per cent is proposed on the ordinary stock, which together with the interim dividend of 5 per cent paid on February 28 last, gives a total of 25 per cent for the year. The preferential stock receives 2 per cent, making in all (with the fixed cumulative dividend) 10 per cent.

New Companies Registered

Chemical Spraying Contractors, Ltd. (25,591). — Private company. Capital £10,000 in £1 shares. Directors: A. M. Bowen; G. C. Taylor; G. S. Chisholm and T. Raines. Registered office: 12 St. Andrew Square, Edinburgh.

Merk & Co. (Great Britain) Ltd. (440,168). Private company. Capital £100. To carry on the business of manufacturers of and dealers in chemicals, drugs, spirits, oils, herbs, roots, etc. Directors: Donald C. Tewson and Francis C. Howard. Registered office: 18 Austin Friars, E.C.2.

South Coast Insecticides, Ltd. (439,826). —Private company. Capital £1000 in £2 shares. Destroyers and exterminators of vermin of all kinds, etc. Directors: F. C. Eldridge; A. E. Whitford and R. F. Eldridge. Registered office: 54a Wycliffe Road, Winton, Bournemouth.

John D. Deas & Company, Ltd. (25,647). Private company. Capital £30,000 in £1 shares. To acquire the business now carried on as "John D. Deas & Co." at 84 Cathedral Street, Glasgow, and to carry on the business of manufacturers of oil, soap, disinfectants, etc. Directors: John D. Deas and J. G. Deas. Registered office: 84 Cathedral Street. Glasgow.

Research Chemists (Farnham), Ltd. (439,746). — Private company. Capital £1000 in £1 shares. Manufacturing chemists and druggists, etc. Directors: P. E. Leapman and Phyllis G. Leapman. Registered office: 25 The Borough, Farnham, Surrey.

Aldos Products (Philjoy) Ltd. (440,282). Private company. Capital £2000. To carry on the business of manufacturers of and dealers in cosmetics, oils, shampoos, hairdressing accessories, etc. Directors: T. D. Vezza and D. St. Q. Cottage. Registered office: 7 High Street South, E.6.

M. Faitelson, Ltd. (440,233). Private company. Capital £600. To carry on the business of manufacturers of and dealers in powders, dyes, soaps, salves, balms, compounds, ointments, lotions, creams and perfumes, and as hairdressers, sundriesmen, chemists and druggists, etc. Directors: Miss Sarah Faitelson, Israel R. Faitelson and Matthias Faitelson. Registered office: 10 Gravel Lane, Middlesex Street, E.C.

Ernest Newton and Co., Ltd. (439,778).—Private company. Capital £50,000 in 20,000 5 per cent redeemable cumulative preference, 20,000 ordinary and 10,000 founders shares of £1. To acquire the business of manufacturing chemists, drysalters and oil dealers carried on by H. Newton as "Ernest Newton and Co." at 15-16 Holt Street, Birmingham. Directors: H. Newton and E. J. Newton. Solicitors: Pinsent and Co., Birmingham.

Chemical and Allied Stocks and Shares

WITH business in stock markets down to its lowest level for two years, small irregular movements have ruled in most sections, fears that increased inflation may result from the Government's crisis plans and talk of fresh political developments being dominating factors. British Funds eased on the failure of the Leicester Corporation conversion offer—92 per cent has to be taken up by the National Debt Commissioners. Industrial shares lost part of an earlier rally, and iron and steels which had earlier showed all round improvement on "no nationalisation" hopes, later eased on the view that despite the economic crisis the Government has decided on nationalisation of this vital industry in due course. As was to be expected buyers concentrated mainly on shares in essential and export industries. In this connection, chemical and kindred shares received more attention, although price movements were small and irregular in accordance with the surrounding tendency of stock markets.

Imperial Chemical at 45s. 6d. lost part of an earlier rally and now yield over 4⅜ per cent on the basis of last year's 10 per cent distribution. Monsanto Chemicals 5s. ordinary were 55s. The market is assuming that in due course Imperial Chemical £1 units are likely to be "split" into four of 5s. each. B. Laporte were 92s. 6d., and W. J. Bush 90s., while Fisons have been dealt in up to 61s. 3d., and awaiting the final dividend and consolidated accounts, the units of the Distillers Co. have changed hands around 142s. United Molasses after 52s. eased to 51s. 6d. British Plaster Board were 27s. 3d., and Associated Cement 70s. 9d. British Glues & Chemicals 4s. ordinary strengthened to 20s., and in other directions, Lever & Unilever were better at 53s. 1½d., while Imperial Smelting firmed up to 20s., and Amalgamated Metal to 18s.

There was increased business in textile shares in response to the big export plans and Calico Printers ordinary improved to 21s. 9d. on hopes that dividends may shortly be resumed. Bradford Dyers were 22s. Fine Spinners improved to 29s. 6d., and Bleachers to 11s. 4½d.

Earlier gains in iron and steels which were due partly to the industry's increased output target were partly lost on the assumption that the Government is planning nationalisation, despite the economic crisis. Guest Keen at 43s. showed firmness in response to the good impression created by the report and accounts. United Steel were 25s. 4½d., Stewarts & Lloyds receded to 51s. 7½d., Dorman Long were 27s. (after 27s. 6d.) but at the time of writing, heavy engineering and allied shares have remained firm on the assumption that in any case they are outside the nationalisation threat. Babcock & Wilcox held their rally to 68s. 10½d. and helped by the company's tractor and kindred interests, Ruston & Hornsby were favoured up to 63s.

Although the market is doubtful if financial results for the year ended June 30 will show any striking recovery. Triplex Glass 10s. units rallied to 32s. 3d. having moved with motor shares which were favoured on hopes of big expansion in export trade. In other directions, General Refractories firmed up to 23s., and colliery shares were favoured on the view that in many cases higher prices than those now current will be justified by the nationalisation compensation terms. Home rails were prominent because they have the protection of the "take-over" prices which it is assumed will be reached by market prices before the exchange into British Transport stock. Boots Drug have been relatively steady at 58s. 9d., Sangers were 36s., and British Drug Houses 13s. 3d., while Glaxo Laboratories firmed up to £22⅝. Oil shares were less active but steadier. Anglo-Iranian improved to £9¾ but later changed hands down to £9½.

Prices of British Chemical Products

THE general chemical market is without feature this week, conditions remaining unchanged and comparatively quiet. New business has been of small dimensions due to seasonal influences and delivery specifications against existing contracts have been similarly affected. No important price changes have been reported either for industrial chemicals or coal tar products. The demand in the last-mentioned market continues to be in excess of supplies.

MANCHESTER.—In the Manchester chemical market as a whole, quotations of the alkalis and other heavy products during the past week have continued on a very firm basis, though little in the way of actual movement has been reported. New business has been of rather bigger volume than was recorded in the previous week, but holiday influences are still in evidence and are likely to be, though on a diminishing scale, during the next three or four weeks. Fresh buying has included orders on export account, although the tightness of supplies in a number of the soda products makes actual overseas shipments a matter of no little difficulty. A full absorption of offers characterises most sections of the tar products market.

GLASGOW.—In the Scottish chemical trade business has returned to near normal after the holidays. There has been a steady demand over the whole field of chemicals. The demand for zinc oxide appears to be on the increase and the supply position is deteriorating. Sodium sulphide is also in heavy demand and here again the supply position is bad. In the export market inquiries have increased. A number of valuable orders for chromium fluoride have been lost as export licences for this material are not obtainable. The demand for caustic soda, sodium sulphide and sodium carbonate, all of which are in poor supply, continues unabated. There has been an increased demand for ground limestone. It is noteworthy that in a few countries it is becoming easier to obtain import licences.

Price Changes

Rises: Sodium metasilicate, lead nitrate.
Decreases: Cream of tartar, copper sulphate.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £56 10s.; 80% pure, 1 ton, £58 10s.; commercial glacial 1 ton £70; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 1/5 tons. £86 10s.; single drums, £87 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 galllons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 to £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—MANCHESTER: £40 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5 cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Antimony Oxide.—£162 10s. per ton.

Arsenic.—Per ton, 99/100%, £38 6s. 3d. to £41 6s. 3d., according to quality, ex-store.

Barium Carbonate.—Precip., 4-ton lots, £20 per ton d/d; 2-ton lots, £20 5s. per ton. bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £20 per ton d/d; 2-ton lots, £20 5s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: 1s. 7d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£44 12s. 6d. per ton f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., from 201s. to 205s. per cwt. lots, d/d.

Formaldehyde.—£27 to £28 10s. per ton in casks, according to quantity, d/d. MANCHESTER: £28.

Formic Acid.—85%, £54 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., £6 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—11d. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d per lb., according to quantity.

Lactic Acid.—Pale tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 95s. to 100s. per cwt., according to quantity.

Lead Nitrate.—About £95 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil: Red, £132; orange £144. Ready-mixed lead paint: Red, £140; orange, £152.

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton Ground in oil, English, in 5-cwt. casks, £141 per ton.

Litharge.—£83 10s. to £86 per ton, according to quantity.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £36 per ton.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 4s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£100 to £105 per ton in ton lots packed in free 5-cwt. casks. MANCHESTER: £5 to £5 5s. per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £57 10s. per ton for 5-ton lots, £57 10s. per ton for 1 to 5-ton lots, all ex store; hydrated, £51 10s. per ton for 5-ton lots, £51 10s. for 1 to 5-ton lots.

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8¼d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 2s. 1d. to 3s. 0d. per lb. d/d.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7¼d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum-ton lots in 2 cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Hyposulphite.—Pea crystals 22s. 6d per cwt. (2 ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£18 per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£23 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £30 10s. per ton d/d for ton lots. Tri-sodium, £35 per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£7 17s. 6d. per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 12s. 6d. to £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £20 12s. 6d. per ton, d/d, in drums; crystals, 30/32%, £13 12s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 15s. per ton;; 140° Tw., arsenious, £4 7s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1 cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £68 15s.; green seal, £70 5s.; red seal, £71 5s.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 8s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£48 to £51 per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £32 17s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in December £20 4s. 6d., rising by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December £9 18s. 6d., rising by 1s. 6d., per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¾d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER, 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000 gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. to 80s. per ton f.o.r. suppliers' works; export trade, £6 15s. per ton f.o.b. suppliers' port. MANCHESTER: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 14s. 6d. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal

m-**Cresol** 98/100%.—Nominal.

o-Cresol 30/31° C.—Nominal.

p-Cresol 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

LONDON.—August 15. For the period ending August 31 (September 13, 1947, for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package; LINSEED OIL, crude, £200. RAPESEED OIL, crude, £190. COTTONSEED OIL, crude, £109; washed, £112. COCONUT OIL, crude, £106; refined deodorised, £112; refined hardened deodorised, £116. PALM KERNEL OIL, crude, £105 10s., refined deodorised, £112; refined hardened deodorised, £116. PALM OIL (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s., in bulk, £97 15s. GROUNDNUT OIL, crude, £110 10s.; refined deodorised, £114, refined hardened deodorised, £118. WHALE OIL, refined hardened, 42 deg., £117; refined hardened, 46/48 deg., £118. ACID OILS, Groundnut, £94; soya, £92; coconut and palm-kernel, £97 10s. ROSIN: Wood, 32s. to 45s.; gum, 44s. to 54s. per cwt., ex store, according to grade. TURPENTINE, American, 87s. per cwt. in drums or barrels, as imported (controlled price).

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Pine Gums

Experimental Work in Italy

FIVE experimental factories in Italy are engaged in studying the possibility of extracting colophony from the local pines. About half a million trees are available for this purpose and it is calculated that they could give a yearly output of 400 tons of resin from which at least 160 tons of colophony and turpentine could be extracted. As Italy is dependent practically entirely on the supplies of colophony from abroad this experiment is of great interest. There are good reasons to expect that a more rational exploitation of the trees and improvements in processing would yield even better results.

A Too-Mechanical Age

"This is a mechanical age and I am the last to decry the value, indeed the necessity, of utilising machinery to the full, but I think that the machine has been allowed to oust the more important factors in life—the spiritual factors—and that we have to go back to these essentials if we are to win through and bring this country back to the proud position which it has held so long."—Mr. Kenneth M. Chance, chairman and managing director of British Industrial Plastics, Ltd., speaking at the annual meeting.

Opencast Coal Plans

Because of the great need of maximum coal production, the Government has decided to extend the current programme of opencast coal mining until 1951. The programme was planned to end in 1949. The decision is intended to enable contractors to carry out the development schemes they have in hand to raise output above the present level of 9-10 million tons annually and to bring into use the machinery which has been ordered in the U.S.A. Opencast mining, since its start in 1942, has produced 36 million tons of coal and now represents about 5 per cent of total British coal production.

Olympia Exhibition

Saunders Valve Co., Ltd., of Newport, Mon., advises that it will be showing a range of six "Safran" centrifugal pumps at the Engineering and Marine Exhibition to be held at Olympia from August 28 to September 13. Among other exhibits there will be a wide range of standard diaphragm valves including the air-motor operated valve and the self-closing valve. The company's glandless diaphragm plug cock for aircraft will also be on view.

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Daimler House, Paradise Street. Birmingham (Midland 0784-5)

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Export Organisation

DURING the period when British prosperity was founded, that is to say during the 19th Century, we were virtually the only industrial nation. Consequently other nations were prepared to accept our advice as to whatever design we thought best would suit their requirements. Since they could get what they required from no one else we were able to dictate what they should have, at what price we would supply it, and when we would supply it. For the most part orders were placed by letter and our manufacturers did not find it necessary to visit their clients. Something of this spirit still survives. There is a disposition on the part of manufacturers to accept orders from home clients for whom they have worked in the past and to neglect the foreign buyer. There is still a take-it-or-leave-it attitude towards the foreign purchaser. There is still a disposition to stay at home and wait for the foreign purchaser to come to us rather than to go to them. Many firms are unwilling to pay the cost of having an agent abroad.

All these criticisms can be countered by reasoned argument on the other side. It is unfortunately true that many of our firms are too small to be able to support a whole-time salaried agent abroad. It frequently happens that there is no director who is able to spare the time to make long journeys abroad in search of business; moreover the cost of making these journeys is not negligible. It must be confessed that there is little inducement for firms to seek orders abroad if they have already an adequate home market; the cost of enlarging premises is prohibitive; the possibility of getting permits to do so is remote; even if both these factors are favourable, the time taken to build a new factory and to get it into production is so long that the markets may have changed considerably before the venture can be established. It is also unfortunately true that many foreign inquiries have always been, and still are, of an unreliable nature upon which a laboratory, a drawing office and an estimating department may spend much time without the remotest likelihood of obtaining an order. It is not unknown for inquiries from eastern countries for plant for the manufacture of chemicals to emanate from students seeking information. Until there is some means of sifting the wheat from the chaff on the spot, it is difficult, and often unprofitable for British manufacturers to set themselves out to do export business except for such plant, chemicals or goods as can be quoted for, as it were, off the shelf.

At a still earlier stage, the smaller concern which comprises two-thirds of British industry, finds it impossible to undertake market research. A firm may decide that it will manufacture for the export market. It has to decide for which countries it will manufacture, how best to secure orders, the type of goods that will be required, and it must have information as to the type of competition it has to face. All this is comprised under the term " market research " and market research is only possible in an organisation large enough to employ the necessary specialists and often to allow those specialists to visit the country concerned. For this reason the Board of Trade encourage what is known as BETRO—The British Export Trade Research Organisation. BETRO was set up by a number of firms who realised from

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their own experience that there must be a change in the haphazard methods of salesmanship which had been so widely followed in pre-war years. It does not sell the goods but it undertakes the market research which charts the geography of the market. For some reason BETRO has not proved generally popular. It has not received the volume of support which had been anticipated. Sir Stafford Cripps voiced his disappointment at this lack of response at the annual luncheon of the organisation recently. He pointed out that the sellers' market is disappearing in many commodities and the time when a buyers' market will replace the sellers' market is now very near. It is a curious, though not altogether unusual, habit of British industry not to worry too greatly about the future. If orders are plentiful, why worry about the orders that will be required to keep the works going the year after next? When orders begin to slacken, that will be the time to exert the arts of salesmanship. This, of course, is a fallacy. Salesmanship should never relax. It may be necessary for the salesman to explain that at the moment he cannot promise rapid delivery but unless he keeps in touch with his customers he will find that when he needs orders they will have been promised to someone else. Nowhere is that more true than in the export market. It is now, when we need export trade, and when the sellers market is disappearing, that the greatest effort should be made to get into touch with foreign clients.

Sir Stafford Cripps has pointed out that BETRO has the staff and set-up that is needed to carry out the market research which is the factual basis for developing our export trade and which is not generally available to exporters within their own organisation. There are two further channels of information. The overseas services staffed by the Civil Service acquires a great mass of general knowledge as to markets, and this information is made available through the Export Promotion Department of the Board of Trade. The more specialised knowledge which requires particular investigation requires a different type of organisation from that of the Export Promotion Department and the Foreign Service. This gap is intended to be filled by BETRO and we are a little puzzled as to why more interest has not been taken in it by British firms. It may be, as we have said, that the fundamental reason is that there is plenty of work about; but, as we have already indicated, that position is now changing and orders are likely to be more difficult to obtain. Sir Stafford Cripps confirmed the imminent change in the character of the markets by pointing out that as the Minister responsible for exports the position was giving him grave anxiety because he knew that " within the next few months we are going to reach the point where we shall have extreme difficulty in achieving that expansion of exports which is vital to our continuing standard of living."

NOTES AND COMMENTS

Britain's Atomic Pile

THE news that the first British atomic pile is working is welcome. Although it is only an experimental pile—a pilot plant, we presume—it is already at work producing radioactive isotopes for medical research purposes. In America, as an article in this issue indicates, over 100 different radioactive substances from 60 different elements have already been manufactured in their atomic piles. The uses for these substances are manifold. They are not, though, by any means all being used for medical research. Among some of the interesting experiments now being carried out in the States with these "tagged" atoms are some dealing with friction and investigations into the composition of the molecular layers which adhere to glass and metal. Other work involves the detection of sulphur in various plant compounds. Great strides have already been made in the technique of using radioactive isotopes in medical research, and results from investigations are already being gathered. Although the American work is more than welcome, we should have liked to see British scientists in the forefront in this field. When the larger atomic pile at Harwell comes into operation next year, however, there may be sufficient radioactive materials to enable our scientists to make up the leeway and eventually forge ahead in this work.

Artificial Rain

FOLLOWING reports of experiments to produce artificial rain and snow, it is not surprising to read that a drought in America has been broken in one of the States by the production of artificial rain by "seeding" a cloud with "dry ice" (solid carbon dioxide at a low temperature). Last year, Mr. Schaefer, the American scientist who pioneered these experiments and who was led up to them by his study of icing conditions for aircraft and the mechanism of ice crystal formation, found a method of producing artificial deposits of snow. He observed that if dry ice in large quantities is sprinkled over snow clouds a fall of snow occurs almost immediately. In February this year 150 lb. of dry ice was dropped on to a large cloud over Sydney, Australia. By means of radar, watchers of the experiment were able to observe the formation of rain drops inside the cloud. Within five minutes of the dropping of the dry ice there were rain echoes from within the cloud. A further 150 lb. of dry ice intensified the echoes and within 21 minutes of the starting of the experiment heavy rain was seen to be falling from the bottom of the cloud and covering an area of about 20 square miles. Even small quantities of dry ice will produce phenomenal effects. In theory, a single ¼ in. pellet of dry ice, when completely utilised, should produce about 300,000 tons of snow. This cannot be achieved, however, because an ice particle less than a millionth of a centimetre in diameter will evaporate even if water is present. Thus only the bigger particles survive. But meteorologists do not consider the time is near when we shall be able to control our weather by this method. According to Mr. Schaefer, it is necessary to have a continuous flow of moisture into the region in order to produce any considerable amount of snow on the ground. Where there are only isolated clouds in the sky the dry ice method will tend to dissipate them rather than form more. This effect, though, may be useful for dispersal of fogs. During one fog, Mr. Schaefer walked through it waving a wire basket full of dry ice over his head. This changed the character of the fog and left a clear space where he had walked. Although at one time it was thought that foreign nuclei were necessary to produce ice crystal formation, it is now known this is not always the case. In one experiment with a cold chamber at −31°F. where there was a continuous supply of moisture there was a continuous snow-fall for two weeks.

The Mine Explosion

COAL, the fuel mainstay, and with petroleum the major source of chemicals, while already the subject of much controversy and back-biting on account of its shortage and the labour problems which its production entails, last week-end jumped into the headlines again when news of the William Pit disaster at Whitehaven was released. From time to time in the annals of the coalmining industry men have died by the hundred to bring this essential commodity to the surface. That there are attendant dangers is well known both by the workers themselves and by the employers—at this moment the infant National Coal Board. It requires no profound depth of thought to forecast that the disaster cannot but have an adverse effect upon the Board's recruiting programme. This in itself, apart from the loss of life at Whitehaven, is a serious matter, and one that cries aloud for remedial action. Despite the countless regulations (infractions of which carry penalties) designed to prevent accidents, they can at best only reduce them. Fire-damp, the usual cause of explosions can normally be detected by the safety lamp carried only by deputies and lone workers such as pumpmen who may have to visit unfrequented roads and cul-de-sacs. To ask colliers, rippers and others to carry them too would be to impose an unreasonable burden on men already laden with tools, food, water and ordinary lamp, and who are expected to travel long distances over rough ground. Yet the risk of explosions may have to be very considerably reduced if the number of men necessary to raise coal output to the Government's target and beyond is to be recruited. What man of sense (in peace time that is) will voluntarily jeopardise his life merely for the sake of earning his living? The issue seems to be this: There has either got to be a higher standard of safety in the mines—in which case the manpower position in the coalmines will at worst remain as it is, or else the old, apparently inadequate standards can be retained—a situation that will demand direction of workers to the pits, *i.e.*, conscription. But on what moral basis can a man be conscripted IN PEACETIME to undertake work so dangerous that men die in batches of a hundred or so at a time?

Better Gas Detection

IT is beyond dispute that present-day safety arrangements are not the best that human ingenuity can devise. It seems to us that the safety-oil lamp is but a primitive instrument for the detection of gas, depending as it does upon the visual preparedness of its bearer and being at the mercy of air currents, water and other factors beyond the power of man to anticipate. The British brains that gave birth to radar to help overcome Hitler in wartime can surely produce an instrument to mitigate if not entirely eliminate the horrors of mass entombment in days of peace.

BRITAIN'S FIRST ATOMIC PILE

BRITAIN'S first atomic pile started up at the Atomic Energy Research Establishment, Harwell, during the past week-end.

This pile, known as the Gleep (Graphite Low Energy Experimental Pile), is the first major unit to be completed at Harwell, and has been built primarily for experimental work in nuclear physics. It will, however, be used for the time being, until the more powerful Harwell pile comes into operation in 1948, for the production of small quantities of radioactive isotopes for biological and medical research. These radioactive materials are required in the first place for the work of the Medical Research Council, but their use is likely to extend, in science generally and in industry.

The pile has been designed largely by a New Zealand group of scientists working at Harwell. Many British scientists have contributed to the production of the pure graphite and uranium, and have designed and produced the instruments required for the pile. Considerable assistance has also been obtained from Canada, particularly in the testing of graphite.

The engineering and constructional work on the pile has been done by the Ministry of Works and its contractors, W. E. Chivers & Sons, Ltd., and Mathew Hall & Co., Ltd., in fifteen months from starting work on the site. This rapid construction has been achieved through hard work and interest on the part of the construction workers employed.

Tin Plate Production in Australia

WITH a view to launching a £10 million tinplate venture in Australia, three special representatives of Broken Hill Pty. are at present in the United States for the purpose of surveying technical processes for the manufacture of tinplate and similar products. Another representative is in Britain for the same reason. It is understood that the surveying parties' reports will soon be available for study by the directors, and depending upon reasonable assurance of an economic basis, a plant may be constructed at Port Kembla, N.S.W.

Chemical and Metal Statistics

National Totals in May and June

A STEADY level of production, with some fairly well defined increases in some chemical output, is reflected by the July number of the *Digest of Statistics* (H.M.S.O., 2s. 6d.) dealing principally with manufacture, consumption and stocks in May. Figures for non-ferrous metals show a rather less stable position, with steadily increasing demand and weakening stocks. Employment in the chemical and metal industries—as recorded in the preliminary summary published last week—is steadily increasing, the total of chemical workers in May being 349,600 and of metal workers 3,369,300. (The figures in the following summary represent 000 tons).

Sulphuric Acid

The sulphuric acid industry in May produced 115.8 tons, which was the peak of a rising production line starting from February (with 88.2 tons) and showing rises of 13.7 tons in March, 7.6 tons April and 6.3 tons in May, when the total was, however, still below the exceptionally high figure of 117.6 recorded in January. Increased consumption of materials was chiefly of pyrites, of which 16.9 tons were taken up, 2.1 tons more than in April. Use of sulphur actually diminished 0.9 tons to 18.2. Spent oxide required amounted to 15.3 tons (April, 14.7) and consumption of the acid produced rose 3 tons to 118. Acid stocks in May were 0.9 lower at 66.4 tons but the stock position of raw materials was generally stronger, pyrites 89 tons (+1), sulphur 79.2 (+8.6) and spent oxide 145.1 (+2.7).

Production of industrial alcohol showed a reduction in May to 1.77 (million gallons), against 2.26 in April, consumption showed little change at 2.25 and the stock position improved a little at 4.34 (April, 4.20). Rising production was recorded by the molasses industry, the cane production of 7.2 (000 tons) being the highest recorded since October, 1946, and beet molasses was 1.5, against 0.2 in April. The last, however, are "out-of-season" figures bearing no relation to the levels commonly reached in the October-January beet processing season. Consumption of molasses for all purposes was lower in May—for distilling 27.5, against 32.2 in April—and stocks showed the normal reduction for the April-May period from 133.5 to 118.5.

Fertilisers

The sharply reduced output by the fertiliser industry is also largely a seasonal matter. Superphosphate total was 87.9 (April, 91.3), and compound fertilisers 118.5 (April, 130.4). Nitrogen content, as an average, was 3.4 higher at 18.9. Consumption showed seasonal reductions: superphosphate 81.8 (April, 112.3) and compounds 158.8 (252.6). Use of ammonia in June was at the exceptionally high level of 31.28 (May, 23.83), a figure which has only once been exceeded in recent years. There was a smaller demand in May for phosphate rock for fertilisers—65.8, against 70.7 in April, but industrial users took up rather larger quantities. Stocks of ammonia and phosphate rock (4.29 and 130.9) were both up, but reserves of fertilisers were reduced, superphosphate to 76.7 and compound fertilisers to 43.1, the latter being by far the lowest quantity in hand for some 12 months.

In the metal industries, steel production in June continued the fairly steady increases recorded in recent months, the total of 254 being 10 higher than in May. Iron ore was 223, against 214 in May and pig-iron 144 (142).

Non-Ferrous Metals

Non-ferrous metals as a whole were subject to increased consumption and the stocks in May were generally at a lower level than for many months. Production of virgin aluminium in April (the latest month quoted) was slightly lower at 2.40, magnesium a little better at 0.23. Consumption of aluminium was rather smaller at 12.6 in April and the use of magnesium rose from 0.18 to 0.30. Consumption of other metals was also on a rising scale, as shown by the May figures: virgin copper 32.9 (+4), zinc 19.6 (+0.9), refined lead 15.3 (+1.4) and tin metal 2.70 (+.06). The diminished stocks are represented by the totals in May of: virgin copper 90.8 (April, 97.5), zinc 33.2 (35.8), zinc concentrates 74 (86), refined lead 12.8 (14.8) and tin 15.5 (16.2).

Polish Chemical Production

Production figures for Poland's chemical industry during the second quarter of the current year show a marked increase compared with those of the first quarter. The following list (the figures in parenthesis show the percentage increase) has been issued by official Polish sources in London. Coal-tar products (33), benzole (29), sulphuric acid (17), hydrochloric acid (48), ammoniacal soda (10), caustic soda (23), nitrate fertiliser (7), ammonia (16), oil paints and varnishes (8), ultramarine (27), soap (9), washing powder (11), rubber footwear (278), tyres and inner tubes (97).

The great nitrate works of Moscice near Cherzów has resumed production of synthetic ammonia.

SCIENTIFIC INSTRUMENTS

Shortages Limit British Industry's Expansion

MEANS to secure in the future continued development of the scientific instrument manufacturing industry on the scale of which its performances in two wars have shown it to be capable formed one of the principal themes of the address recently given by Mr. J. E. C. Bailey, president of the Scientific Instrument Manufacturers' Association to the General Committee of the Parliamentary and Scientific Committee.

Noting that the industry seemed to be really valued only in time of war, Mr. Bailey stressed that its value in peace was just as great. They were faced with two major problems. One was to establish the industry's importance in official circles; the other was to overcome the prejudice that still existed. There was still a strong feeling that if an instrument was German it must be better than a British instrument. That illusion was very difficult to overcome.

Fluctuating Labour Force

In 1910, there were about 10,000 employed in scientific instrument manufacture. At the end of the 1914 war the figure was up to about 22,000, and then gradually reduced. In 1938 there were about 18,000, and that figure was maintained chiefly because of the Key Industries Duty. In the last war employment in the industry went up to 90,000-100,000, but at the end of 1946 they were back to about 65,000.

One of the most pressing problems of the day was the shortage of labour. By the increased use of scientific instruments labour could be made available for more productive work. Large users of instruments, such as Imperial Chemical Industries, Courtaulds, Unilever, etc., had already expressed their deep anxiety about the shortage of instruments.

Valuable Exports

The industry had a dual rôle to play here in the matter of imports, namely, exporting its own products and helping other industries to develop their research to find new materials and to increase their production generally.

The industry's own exports were especially important because their conversion factor was of the highest kind. The intrinsic value of the raw materials was negligible compared with selling prices. The real exports were the skill and brains of the designer and the craftsmanship of the worker.

Exports in 1938 were £1,300,000 and in 1946 £3,100,000. These hardly reached the Government's target, taking into account a probable 100 per cent increase in price.

New laboratories were going up, being planned or erected, but it was impossible to specify where the instruments were coming from. There was a great opportunity for this industry to fulfil its functions in the home and overseas market, but they had not been able to impress on the authorities that the scientific instrument industry merited special attention. The industry was largely concentrated around the London area, and the Government were loth to grant building licences. Since the war there had been no general expansion whatsoever.

German Competition

Skilled workers had been reserved until almost the end of the war, and being last in would be last out. The calling up of young men had interfered with apprenticeships, and that problem had only just been solved. The industry was trying to get priority for materials. It required 5000 tons of steel, and was allocated only one-quarter of that. Yet the industry was the tap that could open the floodgates of other industries.

In Germany, about 90 per cent of the instrument industry had remained intact. They had the plant, machinery and men, but not the material. In this country we had neither plant, machinery, material, nor men. It was not suggested that the German industry should be completely done away with, but there should be some measure of control until the British industry could start level.

There was no control of the German scientific instrument industry. It was allowed to make what it liked. The only slight measure of control was fixing of prices by the new Agency Import Commission. The commission, however, was in danger of competing with the industry here and underselling.

It had been suggested that the Germans should not make any optical glass since it was potentially a war potential, but the Americans had set up an optical plant in their zone.

U.S. Competition with German Aid

What would be the effect of the German scientists who had gone to America? It might well be that America would become a serious competitor. In many fields U.S. manufacturers were cutting their prices very much lower than ours.

Mr. Bailey concluded by saying that he was quite confident that the British scientific instrument industry could produce a scientific instrument second to none, and, given the opportunity, would do so

An Alkali Inspector Sums Up—II

Troublesome Sulphur Compounds

by W. A. DAMON

SULPHURIC acid is produced by both the lead chamber and the contact process. The escapes of sulphur and nitrogen oxides from the former run normally at about 1.5 grains expressed as SO_3 per cu. ft., although a maximum of 4 grains is allowed by the Act. Provided plants are properly designed, with adequate chamber and tower spaces and with sufficient acid cooling capacity, there is seldom much difficulty

In order to effect economy in nitric consumption and to avoid the "red flag" characteristic of the discharge of excessive quantities of nitrogen oxide, a time contact of not less than 30 seconds should be allowed for the gas in the packed space of the Gay Lussac. The speed of the gas should be not more than 3 ft. per second. A substantial improvement was effected some time ago by the addition of a tower in which the gases are washed with a small quantity of water between the Gay Lussacs. Not only does this remove excessive SO_2 and nitre but it tends to stabilise the nitrous gases in the form of N_2O_3 which is most readily absorbed by the final Gay Lussac.

Over 50 per cent of the total sulphuric acid is now produced by the contact process in which SO_2 and O_2 are catalysed to produce SO_3, which is subsequently absorbed in strong sulphuric acid. The efficiency of conversion is dependent on correct temperatures, correct gas mixtures and a catalyst mass in good condition.

Until recently such conversions have not often exceeded 95 per cent and consequently the escape to atmosphere of unconverted SO_2 was frequently five grains per cu. ft. or more, except in cases where the post absorber gases were scrubbed by ammonia or soda. Lately there have been developments which are likely to bring conversions up to 98 per cent and experiments are also in hand whereby it is hoped to establish more economical methods for the recovery of unconverted SO_2.

Petroleum Works

One of our greatest difficulties lies in the treatment of gases and fumes from the distillation and cracking of petroleum. The offensiveness of these gases is due to the presence of small quantities of hydrogen sulphide and mercaptans. It is usual to collect and pass them through a scrubber in order to remove a light hydrocarbon, after which treatment they are burned under the boilers or stills. The sulphur compounds are thus converted to sulphur dioxide which in low concentration does not normally give rise to nuisance and is definitely less objectionable than H_2S.

The light gases arising from sour oils during storage also possess an offensive odour and care must be taken to minimise their escape.

Finally the various effluent waters require special means of disposal. It will be realised that to cope effectively with all the possible sources of offence at a large refinery is a most difficult and expensive matter. An elaborate gas collecting system is necessary and the branch mains should all be provided with automatic governors to ensure even and continuous suction at all points.

It cannot be claimed that we have yet achieved 100 per cent success and a large refinery is still likely at times to be an unpleasant neighbour even though it may be honestly employing the best practicable means.

Chemical Manures

The gases evolved during the decomposition of phosphate rock by mineral acid consist chiefly of CO_2, but they contain also varying proportions of HF, SiF_4 and SO_2.

In order to allow for the relatively slow reaction of SiF_4 with water vapour it is desirable to provide a long flue or delay chamber in which the gases can be wetted and from which deposited SiO_2 can be readily removed. They must then be subjected to a water wash to effect the removal of acid gases. This is usually done in void towers provided with fine water sprays.

A tower space of 400 cu. ft. per ton of superphosphate made per hour is not excessive and with such provision the escaping gases should possess an acidity of less than the equivalent 0.1 grain of SO_3 per cu. ft. The washing plant should function with an efficiency of over 98 per cent.

Sulphuretted hydrogen is an unpleasant gas which unfortunately arises from many chemical processes. Normally it is fairly easy to deal with, *e.g.*, by oxide of iron purifiers, Claus kilns, absorption in alkali, etc.

An interesting and useful apparatus for checking the efficient operation of an absorption system is that devised by Robert & Minors. It depends on a beam of light passing through a lead paper and focused on a photo-electric cell. Decolorisation of the paper by H_2S reduces the intensity of light falling on the cell and causes a warning to be given by lighting a red light or similar means.

An excellent indicator can be provided by the continuous bubbling of a sample of the washed gas through a solution of sodium nitroprusside. The pale yellow solution becomes pink to violet on combination with H_2S (depending on the concentration) and the reaction is reversible. It can be adjusted to a sensitivity of 2 p.p.m.

In some cases contamination with organic compounds complicates matters and recourse has to be had to combustion methods.

A major problem is that of the large volumes of vitiated air exhausted from viscose works. Viscose rayon is made by decomposing sodium cellulose xanthate with sulphuric acid. Theoretically this should give rise to cellulose, sodium sulphate and carbon bisulphide, but in practice there are side reactions which result in the production of hydrogen sulphide and mercaptans possessing a most disagreeable smell.

It is of primary importance that the operatives should be protected against any ill effects produced by these gases and the spinning machines must therefore be well draughted. With the ordinary open type of machine this necessitates about 30 cu. ft. per spindle per minute.

The possibility of inhibiting the release of H_2S from the spinning bath has not been overlooked, but the composition of the spinning bath is of great importance in influencing the quality of the filament and interference with it is regarded with disfavour. At a works producing heavier goods such as capsules and tubes, the method has been used successfully.

Zinc Problem Unsolved

The fume arising from the production of zinc in horizontal retorts is a great nuisance and no practicable way of curing it has yet been found. A much improved technique of distillation in vertical retorts has been developed and the fumes from this process can be dealt with. The conversion is, however, an exceedingly costly matter and it is beyond the authority of the Alkali Inspector to insist on it.

Sulphur dioxide may be readily absorbed of course, by alkali, but the market is limited. It may also be absorbed in basic aluminium sulphate, whence it can be removed again in concentrated form by heating.

On the Continent, the sulphidine process is operated. According to this process sulphur dioxide is absorbed by an aqueous solution of toluidine or xylidine and can be recovered by heating.

The removal of sulphur oxides from waste furnace gases is a matter of difficulty and of considerable expense. Experimental work is in hand directed towards the investigation of processes which may be cheaper and of more general applicability than those at present in use.

Chlorine Precautions

Chlorine is used in a great number of industrial processes and it is obviously necessary that precautions should be taken to prevent its escape to the atmosphere. Absorption in lime or alkali is normally quite easy and satisfactory, provided an alkalinity of not less than 5 per cent is maintained, that there is a good depth of well agitated absorbing liquor and that a temperature of about 70°F. is maintained.

In certain circumstances traces of escaping chlorine may combine with organic substances to produce lachrymatory compounds, the effect of which is more marked than chlorine itself. A case of this sort has recently caused a great deal of trouble, but the difficulties are being gradually overcome.

Tar distillation can be a highly offensive process if due precautions are not taken to deal with the incondensible gases. The normal practice is to draught these gases from the condensate collectors and to inject them below the still fires.

The discharge of pitch unless well cooled is also accompanied by acrid fumes, discharge of which to atmosphere can be prevented by providing either an oil wash or causing the fume to pass through a baffled chamber in which the particles coalesce and are deposited.

Exemptions from Duty

The Treasury announces that it has made an Order under Section 10 of the Finance Act, 1926, exempting the following chemicals from Key Industry Duty for the period August 13 to December 31, 1947:—

Formic acid (strength not less than 98 per cent by weight), dicyandiamide, ethyl orthoformate, ethyl phenyl-ketone (propiophenone), and succinic anhydride.

The Order, "The Safeguarding of Industries (Exemption) (No. 4) Order 1947" (S.R. & O. 1947, No. 1680), is obtainable from H.M.S.O., price 1d.

New B.S. Specification

A new British standard issued by the B.S.I. for reinforced diamond dies represents the first attempt at any specification in this field, and relates to those with bores up to 0.06 in. diameter. It indicates the desirable characteristics of the stone and defines the appropriate minimum wall thickness and minimum weights for various bores. Copies of the specification B.S. No 1393 (1947) are obtainable from the British Standards Institution, 28 Victoria Street, S.W.1.

BRITISH ROCKET STATION

Role of Hydrogen Peroxide

ALTHOUGH British work on rocket propulsion is still secret, journalists who were invited to the new rocket research station at Westcott, Bucks., on Wednesday of last week, were able to see how far the Germans had advanced in the rocket field and the different fuels and oxidants they used. Whatever British experiments were going on had been carefully put to one side for this visit, so that a one-sided impression may have been obtained.

The head of the station, Dr. W. R. Cook, explained that Westcott had been selected as the central experimental establishment for all applications of rocket propulsion, although practical tests in the air will be carried out at other stations, *e.g.*, in Australia. The establishment is sub-divided into sections dealing with research and development on combustion chambers; the methods of fuel supplies (ranging from compressed gas to pumps and turbines); combustion kinetics; heat transfer; and special materials. He mentioned that although the Germans did a lot of pioneer work, the study of rocket propulsion is still in its infancy, and there is much work to be done on the most efficient types of fuels and oxidants, and the metals to be used for the combustion chambers.

The number of British workers who will eventually be at Westcott is not known, but there are at present 12 German scientists who were previously working on rocket work in Germany.

Fuel Feed Problem

One of the problems in rocket propulsion is that of getting large quantities of fuel into the combustion chamber. For this purpose steam produced in various ways is used to drive turbines which pump the fuel. For fuel a single substance can be used, or a fuel and an oxidising agent. The principal oxidising agents used are liquid oxygen, concentrated hydrogen peroxide and nitric acid.

Hydrogen peroxide is the only substance which has been used as a mono-propellant. It decomposes catalytically with liquid sodium or potassium permanganate to produce superheated steam and oxygen. This steam was used to drive the turbines of the V-2. Catalytic stones, composed of cement and permanganates, which will decompose a thousand times their weight of H_2O_2, can also be used. At first this reaction is a chemical reaction, but subsequently it becomes a catalytic reaction. Hydrogen peroxide has also been used with various fuels as the main oxidising agent, *e.g.*, with methyl alcohol, hydrazine hydrate and a catalyst of potassium cupro-cyanide. It can be used with paraffin, but ignition has to come from an outside source.

(*Continued at foot of next col.*)

COAL STOCKS IN N.W.

Better than Year Ago

COAL stocks are being slowly built up by hundreds of firms in the North-West in an effort to avoid a repetition of last winter's fuel crisis. Many have accumulated a three weeks' supply—a much better position than a year ago. This has been possible only by the most stringent economies with summer supplies. Fuel quotas—very much reduced from normal—have not been fully met this summer, and it has been an arduous task to try and put stocks away for winter. Conversion from coal to oil burning has helped to spread out fuel supplies to others dependent entirely on coal. Pilkington Brothers, the St. Helens glass firm, have recently turned over much of their plant to oil burning. Generating plant has been installed in many Lancashire and Cheshire engineering works. Among coal stock reports from North-West firms are : W. T. Glover's, electric cables, Trafford Park, employing 1100—three weeks' reserves, much better than a year ago; Clayton Aniline, chemicals and dyes, employing 1700—at least two weeks' reserves; Renold and Coventry, chain makers, Heaton Mersey, employing 3000—close on 21 days' reserves; Linotype and Machinery, Ltd., Broadheath—ten days' reserves.

COAL BORING

AN application by the National Coal Board for permission to begin boring operations in the Wrexham area has caused speculation regarding the possibilities of a modern colliery being opened. The Coal Board, it is understood, is to begin boring operations near Whitegate factory, and in the direction of Marchwiel where one bore hole already exists. Plant for the operations has already been secured and as soon as arrangements have been made for the discharge of the effluent, preliminary arrangements will be made for setting up the machinery. In view of recent statements that there was no immediate prospects of reopening some of the old collieries in the area because the shafts were not suitable for modern methods, there is a belief that if the new borings prove successful, new shafts will be sunk on the south side of Wrexham which will embody the latest British and Continental ideas in mining technique.

Among the demonstrations shown to the visitors were experiments with the various fuels, the 4 cwt. motor of the German rocket fighter in operation using 2 gal. per second of hydrogen peroxide, hydrazine hydrate and methyl alcohol, and an assisted take-off unit.

I.C.I. HAS A SIX-YEAR PLAN

NEW railway lines and roads, more engineering workshops and a works housing scheme are included in the expansion plans of Imperial Chemical Industries, Ltd. (Alkali Division), Northwich, for the Winnington and Wallerscote works. Probable date for completion of the scheme, which it is estimated will cost several million pounds, is given as 1953.

Mr. W. M. Inman, chairman of the Alkali Division, said that the demand for alkali was continually increasing and it was essential production should keep pace with demand, not only for home needs, but because of the vital need for increasing Britain's exports. "Considerable extensions are already being carried out within the works area," he said, "but a further programme of extensions is being considered which would involve not only a large-scale reorganisation within the works, but also breaking new ground outside the present boundary."

Proposals for extending the Winnington and Wallerscote works were outlined by Mr. G. A. Begg, chief engineer. Present rail facilities to and from the works must be increased, either by doubling the present line from Hartford and Greenbank to Winnington works, or by constructing a new line connecting the C.L.C. with the L.M.S. between Hartford and Acton Bridge. These alterations were being considered by the railway authorities, who, it was expected, would carry out the work. "A major item of new construction which would be required outside the present works would be new engineering workshops," said Mr. Begg. "A possible site for these, together with garage accommodation and additional stocking ground for new materials, is on the land at present known as Jubilee fields." The plans would necessitate various alterations in the layout of roads in the area, and the provision of new playing fields.

BRAZIL IMPORT LICENCES

The following commodities may now be imported into Brazil without the need for obtaining a prior import licence: Resin, turpentine, oil of pine including its products and derivatives, tar and pitch of vegetable origin, lac and shellac, nux vomica, cellulose—sulphite and sulphate, bleached or otherwise, abrasives—natural or artificial, petroleum and its derivatives, carbon and graphite electrodes, sulphur, cryolite, copper, brass, bronze, lead, nickel, tin and zinc, chemical products for industrial, medicinal and pharmaceutical use, and fertilisers.

NON-FERROUS METALS

DETAILED figures of consumption of non-ferrous metals in the U.K. during the second quarter of 1947, relating to zinc, lead, tin, cadmium and antimony, have been issued by the Directorate of Non-Ferrous metals. The attached table shows consumption of virgin metals and scrap for the various trades. Total figures of the consumption of virgin metal only, including, for comparison, the year 1946 and first quarter of 1947 are as follows:—

	Year 1946 Tons	First quarter 1947 Tons	Second quarter 1947 Tons
Zinc	216,089	48,701	57,946
Lead	193,506	42,535	40,237
Tin	25,606	6,663	6,857
Cadmium	542	122	130
Antimony	5,623	1,160	1,317

Principal consumption of zinc was by the brass manufacturing industry, which took in the first quarter of this year 24,415 tons and in the second quarter 28,377 tons. The next largest users were galvanisers, with 17,770 and 19,109 tons, followed by the zinc oxide industry—11,710 tons and 13,634 tons.

The main users of imported and scrap lead were cable manufacturers (20,961 and 23,139 tons) and sheet and pipe manufacturers (17,860 and 21,453 tons). The manufacture of alloys absorbed the largest proportion of the total tin allocation to trades, using in the first quarter 3485 tons and in the second 3434. Other principal users were tinplate, 2074 and 2210 tons; and solder, 1552 and 1325 tons.

Plating (52 and 61 tons) and colours (dental and glass, 40 and 29 tons) absorbed most of the industrial allocation of cadmium; antimony was distributed principally to oxides and compounds (498 and 656 tons), antimonial lead (255 and 176 tons) and bearings (158 and 156 tons).

Zinc Consumption

According to statistics prepared by the Directorate of Non-Ferrous Metals, 82,301 long tons of zinc were consumed in the United Kingdom during the second quarter of this year compared with 69,436 tons in the first quarter. Lead consumption amounted to 76,303 (70,860 first quarter) of which 40,237 were imported. 8657 tons of tin were used (8463), cadmium 130 tons (122), and antimony metal and compounds 1317 (1160).

Change of Address.—Aluminium Union Limited announces that it has now returned to The Adelphi, Strand, W.C.2 (TEMple Bar 3535) where all communications should now be addressed.

RADIOACTIVE ISOTOPES

WIDESPREAD USES—TRANSPORT DIFFICULTIES

ALTHOUGH it was only just over a year ago that the first sale was made of a beneficial radioactive isotope produced from the uranium chain-reacting pile of the Monsanto Company's Clinton Laboratories, to-day more than 100 varieties of radioisotopes are in production at these laboratories. The Atomic Energy Commission reports that in the first year of production Clinton Laboratories has made 1092 shipments of radioactive elements. These have been made to scientific and industrial research institutions throughout the continental United States and the territory of Hawaii.

The 1000th shipment was made on July 9. It was a unit of phosphorus 32 consigned to the U.S. Public Health Service at Washington to be used for fundamental biological research in disease control.

The isotope production and distribution programme, which was set up under the Manhattan District of the U.S. Army Corps of Engineers, has been carried forward under the Atomic Energy Commission. Requests for the radioisotopes are reviewed and approved by a special Allocations Committee and distribution is supervised by Dr. Paul C. Aebersold, chief of the Isotope Branch of the Commission. Isotope research and production has been co-ordinated at Clinton Laboratories by Dr. Edgar J. Murphy, assistant research director.

Before the chain-reacting pile was available, most artificially produced radioisotopes were made in cyclotrons. The cyclotron, however, was capable of producing only limited quantities of radioactive materials. An example of this is seen in the estimated cost of cyclotron-produced C 14 of $1,000,000 per millicurie against the present price of $50 for the same amount manufactured in the pile.

Advantages of Isotopes

The tremendous advantage of the radioisotopes lies in the fact that while they are chemically identical with the stable forms of the elements, they are radioactive and their radioactivity can be detected. Thus, a minute quantity of one of these isotopes can be followed through complicated chemical reactions through the metabolic process in the body, through entire biological cycles or through any other physical or chemical processes and still be identified. Dilutions or chemical changes of the tracer isotope make no difference. The radioactivity will still register on a Geiger counter or show its course on photographic film. The atoms are tagged for as long as the radioactivity lasts.

The rate at which radioactive materials undergo transformation is measured by time intervals called the half-life. At the end of the first half-life period the amount of radioactivity is half the original amount. In the next half-life interval, half the remaining activity—or one-fourth the original amount—remains. The half-life of different materials varies widely. For uranium 238, it is 4.5 billion years; for carbon 14, it is 5100 years, and for radium, 1590 years. Radiogold has a half-life of 2.7 days. Radioactive potassium has a half-life of 12.4 hours and a special isotope of polonium has a half-life of approximately one-millionth of a second.

Production and Transport

Production of radioisotopes at Clinton Laboratories was made possible only after considerable research. Overall administration has been in charge of Dr. Charles A. Thomas, technical director of Monsanto Chemical Company. Thomas, who was a member of the five-man committee which prepared the Acheson-Lilienthal Report on the International Control of Atomic Energy for the State Department, also took an active part in the development of the atomic bomb.

Radioisotopes are distributed for scientific research only upon request. Allocation of the materials by the Isotopes Branch is based upon the Advisory Committee's recommendations and considers such matters as the requestor's facilities, nature of research and whether or not results of the work will be made public. Priority is given to those institutions performing work of a purely scientific nature which can be made available to other researchers.

Transportation of these radioactive materials presents difficulties as special containers have to be used for them. These containers range in weight from less than a pound to a ton. The amount of shielding varies with the amount and energy of radiation. The average container, such as used for shipping the radioisotope of iodine (I 131), weighs between 100 and 150 lb. The thickness of lead shielding is from ½ in., depending upon the amount shipped.

The radioactive material is first placed in a glass bottle which is inserted in an air-tight stainless steel cylinder. The cylinder, in turn, is placed inside a lead shield which is supported firmly inside a strong wooden box. Complete directions for opening the lead shield are placed inside the box which is then sealed for shipment. The box is finally checked with sensitive radiation instruments to determine the amount of radiation at the surface. Should this prove to be above tolerance, the substance is repacked with a thicker shield.

Although during the past year radioactive substances have been shipped more than 700,000 miles by regularly scheduled airlines, some airlines still refuse to handle the radioisotopes. They mistakingly fear the radioactivity will affect navigation instruments, such as radio and compass, or items of transport. The scientists at Clinton, however, state that the radiation intensity at the surface of an isotope container is approximately the same as that at the radium dial of the pilot's wrist watch.

Radioactive Cobalt

Perhaps one of the largest and most interesting shipments of radioactive material under this programme was in February, 1947, when a 23-gram unit containing radioactive cobalt (Co 60) was shipped to the Bureau of Standards in Washington. The container, shielding the cobalt oxide which was equivalent in weight to a 50 cent piece, weighed 1600 lb. This isotope, which has a half-life of 5.3 years, is being used by the Bureau to furnish radiation standards to research workers for calibration of radiation measuring instruments.

Some of the most important radioisotopes for fundamental research in medicine have especially short half-lives. These include radiogold (2.7 days), radiopotassium (12.4 hours), radiosodium (14.8 hours), radioiodine (8 days) and radiophosphorus (14 days).

Shipments of these materials are handled as expeditiously as possible. When an order has been processed and a shipping date set, prior arrangements relative to shipment are made with an airlines agency and the shipment—after being properly packaged—is sent by fast truck to the airport just before flight time. Simultaneously, the customer is notified of the departure time and advised to meet the plane at its destination and arrange for prompt delivery.

Radioactive materials emit only gamma and beta rays and alpha particles which have no effect upon radios or aircraft instruments. Lead shielding of materials emitting gamma rays will afford very adequate protection of personnel and undeveloped film from this radiation. No commodity or merchandise other than undeveloped film can be affected by proximity to the radioactive material as shipped.

Although radioisotopes have important uses as therapeutic agents in the treatment of certain diseases, their most important single contribution to mankind is as a research tool. The value of isotopes in research has been compared to the utility of the microscope. Thus as the microscope opened new fields of scientific endeavour, so will radioisotopes further expand the vista of fundamental knowledge.

The tracer technique, by virtue of the infinitesimally small amounts of chemicals which can be detected through their radioactivity, will enable researchers to study many physical, chemical and biological phenomena which heretofore have remained unsolved.

In a recent address, Dr. Thomas cited the great value of radioisotopes in fundamental research in the field of pure chemistry. He said their use is an important aid in studying the mechanism of organic reactions. "Already," he added, "experiments using radioactive elements have given an insight into many difficult chemical problems."

During the year, shipments have gone to approximately 170 institutions and researchers scattered throughout the country, and approximately 100 varieties of radioisotopes have been made from around 60 elements.

Among them was radiophosphorus and radioiron for agricultural studies, radiophosphorus and radioiodine for medical research and treatment, radiosodium, radiopotassium and radiomercury for investigations in human physiology and heart disease, special pile irradiated steel bearings for applied research on friction problems in industry, and radiocarbon, radiosulphur and radiopotassium for fundamental research on disease control.

Molecular Layer Investigation

Investigations on basic chemical processes are being conducted at the University of Wisconsin. Studies have begun of the nearly weightless layers of foreign molecules and ions (charged atoms or groups of atoms) which attach themselves to glass and metal surfaces. From these investigations of the factors involved in the formation of such layers, a better understanding of chemical forces at the surface is being obtained. Such information may be of practical usefulness in the fields of catalytic action, electroplating, mirror formation and detergent action.

The use of radiochlorine, radioactive bromine and iodine in studying the exchange reactions of these elements with molecules containing the same elements is also reported. In other words, do the chlorine atoms of sodium chloride interchange with chlorine atoms in certain more complex molecules? It would be impossible to observe such reactions without the radioactively tagged atoms. The reasons for this study are to attempt to understand the mechanism of complex chemical reactions.

Among the industrial aspects of the work are experiments in friction. Steel that has been made radioactive in the pile is being used to determine what happens to metal during friction and wear. The active specimens will be employed in experiments on dry and lubricated friction phenomena to investigate the rôle that material transfer plays in these phenomena, and it will also be employed in research at the Massachusetts Institute of Technology to investigate the surface of layers developed on the piston rings and cylinder walls of well run-in aircraft engines. Tests at the Massachusetts Institute of Technology have shown that the tracer method makes it possible to detect as little as one hundred-billionth of an ounce of metal transferred from one surface to another by friction. This sensitivity is thousands of times greater than that of previous methods. Such studies of the exchange between sliding surfaces is of extreme importance in understanding friction. It may lead to important advances in the treatment and composition of surfaces to reduce frictional wear in all types of machinery.

Metallurgists also are finding many uses for radioactive tracers. They are studying such diversified problems as the aging of ferrous materials by following the diffusion of carbon atoms, the thermionic activity of filaments, and the absorption of gases in metals. Other fundamental problems confronting the research metallurgist which can be solved by radioactive tracers are related to oxidation, diffusion, vapour pressures and the kinetics of reaction in solid alloys, such as age hardening, quenching, annealing and homogeneity of powder mixtures.

One of the major processes to be developed by the steel industry is a controlled method for removing sulphur from iron when the iron is separated from the slag. Before this can be accomplished, the mechanism by which sulphur is distributed between slag and metal must be understood. Metallurgists are now in a position to study the reaction, since radioactive iron and sulphur tracers can be introduced into the process.

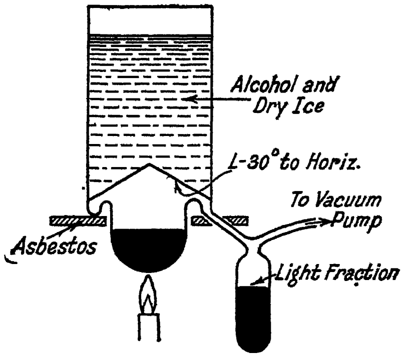
ISOTOPE SEPARATION BY COUNTER-CURRENT METHODS

In connection with work on the natural isotopes of potassium and chlorine, new methods for isotope separation by counter-current techniques have been developed at the U.S. National Bureau of Standards. One method using counter-current electromigration makes use of the difference in the ionic mobilities of the isotopes of an element and has been developed to a point where it can be used as a practical means of separating not only isotopes, but ionic species in general.

The natural isotopes of potassium and chlorine have been efficiently concentrated by counter-current electromigration, and it is expected that further research will result in techniques for the concentration of the isotopes of other elements, including silver and copper, by this method. Counter-current electromigration has been suggested as a means of separation of like elements, such as the rare earths, whose chemical properties are so similar that an elaborate procedure involving thousands of fractional crystallisations has been required for separation.

It had long been suspected that isotopic ions of a given element in solution might differ in their migration velocities, the lighter isotope having a slightly faster rate of migration than the heavier. Lack of suitable techniques had prevented demonstration of the reality of this effect until the need of a simple, easily controlled method of isotope separation resulted in the counter-current electromigration. The entire process takes place within an electrolytic cell containing anode, cathode, and suitable electrolyte. The basic principle of operation of the method rests in an imposed flow of electrolyte through the solution in a direction opposite to the migration of the ions to be separated. If the rate of flow of the electrolytic counter-current is made equal and opposite to the average rate of an ion transport, then only the lighter isotopic ions will make headway against the current, while the ions of the heavier isotope are carried in the opposite direction.

The process was first used in the separation of the isotopes of potassium. A



A single-stage still

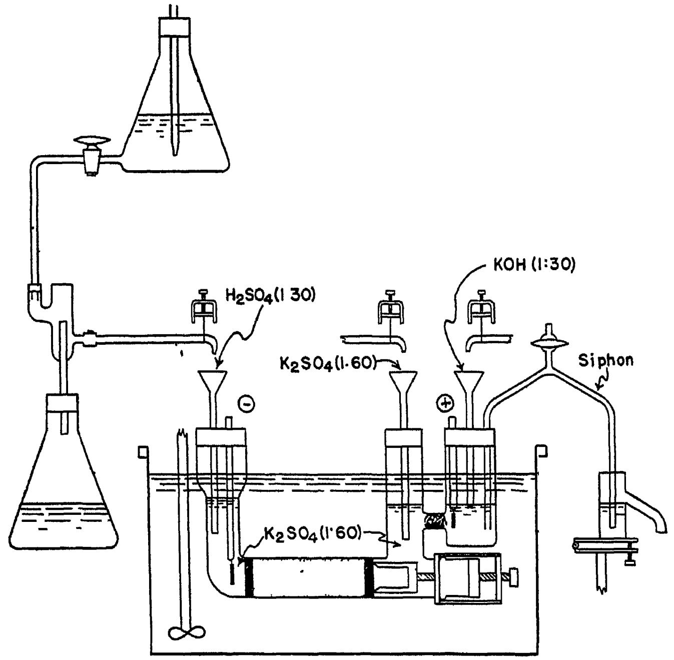


Diagram of equipment for the separation of natural isotopes of potassium by counter-current electro migration. Numbers in brackets express solution concentrations as equivalent ratios of solute to water.

U-shaped electrolytic cell consisting of vertical anode and cathode compartments separated by a horizontal tube packed with 100-mesh sand was constructed, the anode compartment connecting by means of a siphon to a constant-level spillover. Platinum electrodes were placed so as to provide a uniform potential distribution across the packing. Before starting the run, the cell is filled with an electrolyte, such as K_2SO_4, to the desired level as determined by the height of the spillover. When the current is turned on, K+ ions migrate toward the cathode compartment, while SO_4 ions migrate to the anode. An electrolyte stream flow is induced in the cathode-to-anode direction by slowly adding more liquid to both cathode and anode compartments, the excess being automatically siphoned off at the anode. In practice a solution of H_2SO_4 is added to the cathode compartment and KOH to the anode compartment. These are known as restituent liquids, since they act to restore the original chemical composition of the electrolyte in the cell. It was discovered that when the concentration and rates of addition of both restituent solutions are such that the concentration and *p*H of the electrolyte throughout the cell remain constant during the run, the flow of electrolyte through the packing (a fine-grained packing of uniform porosity) is just equal to the average rate of progress of potassium ions toward the cathode. The net transport of potassium ion is thus reduced to zero as the lighter K^{39} ions make headway against the electrolytic stream while the heavier K^{41} ions are washed back. The packing thus behaves as a fractionating column under total reflux and K^{39} is concentrated in the cathode compartment. Since the anode compartment is constantly being supplied with KOH, the K^{39} concentration remains at its normal value. As a result, this compartment serves as a constant supply reservoir. The point balance between ion migration and stream flow is confined to the uniform porous packing separating the cathode and anode compartments.

In the work on concentration of the light potassium isotope, the ratio K^{39}/K^{41} was increased from 14.2 in ordinary potassium to 24 in the concentrate in 449 hours. An extension of this procedure has been found practical for the simultaneous concentration of both K^{39} and K^{41} in cathode and anode compartments respectively, and is expected to prove useful for further isotopic concentration of small amounts of enriched potassium salts.

The chlorine isotopes Cl^{35} and Cl^{37} have been separated by a similar procedure with certain modifications. When NaCl solution is used as an electrolyte and NaOH and HCl as restituent liquids at anode and cathode respectively, Cl^{35} can be concentrated in the anode compartment provided the original isotopic ratio is maintained in the cathode compartment. However, if the chloride ion is allowed to react at the anode to form chlorine gas, it will escape, thus changing the relative proportions of chloride isotopic ions. To prevent such a reaction, a solution of NaOH was interposed around the anode to form a boundary between the chloride and hydroxide solutions. Since it was necessary to use a NaOH solution of greater density than the NaCl solution used, a goose-neck anode compartment was designed so that the alkali solution might be the lower layer at the anode boundary. In this work the ratio Cl^{35}/Cl^{37} was increased in the light concentrate from 3.12 to 4.18 in 474 hours.

Advantages Over Other Methods

The counter-current electromigration method has several inherent advantages over alternative methods of isotope separation that have been used in recent years. The simplicity of the apparatus, both in construction and operation, is perhaps its most important feature. Isotopic separation takes place in a single step without the need of a vacuum system or other elaborate accessories. The system requires very little attention, and with the use of automatic controls for addition of restituent liquids it becomes entirely self-regulating. The use of a very fine, uniform porous packing provides a much higher reflux efficiency per unit length than may be achieved by other fractionation methods of isotope separation. Hence, the assembly has the advantage of requiring a minimum of space for the results accomplished. The process has the added convenience of being well adapted to use with many elements which may easily be obtained in ionic solutions.

Other research has resulted in a new and highly efficient type of counter-current reflux molecular still for the separation of natural isotopes. It has proved to be an effective instrument for the separation of the natural isotopes of mercury, and is expected to have application to isotope work on other elements. Plans are being made for the application of this type of apparatus to the separation of pure hydrocarbons from petroleum and the isolation of vitamins from animal and vegetable products.

The term molecular distillation has been applied to that type of distillation where there is no return of escaping molecules to the evaporating surface. This is accomplished by operating with high-boiling (low vapour-pressure) liquids under such high vacuum that the mean free path of the escaping molecules is of the order of the distance between the surface of the evaporating liquid and the cooled condensing surface of the still. In molecular distillation, the relative rates of escape of the various types of molecules from a composite liquid surface are determined by two factors: (1) the vapour pressure (boiling point) of each component, and (2) the average molecular velocity of each component. Vapour-pressure differences among the isotopes of the heavy elements are small or non-existent, whereas molecular velocities, at a given temperature, are inversely proportional to the square roots of the atomic weights. Molecular distillation thus offers a very practical means not only for separation of the isotopes of the heavier elements, but also for the separation of any mixture of high-boiling substances differing in molecular or atomic weight. The latter application is particularly useful in the separation of hydrocarbons that do not differ appreciably in boiling point or are unable to withstand the high temperatures of ordinary distillation.

Previously, in order to obtain appreciable concentration of mercury isotopes, using small single-stage molecular stills, it was necessary to repeat the separation process many times, requiring an elaborate system for collecting, recombining and distilling fractions. To overcome these difficulties, a

(*Continued on page* 266)

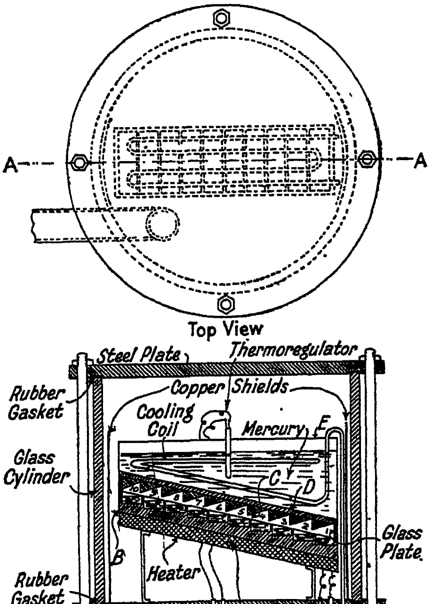


Diagram of 10-cell cascade system for separation of isotopes by counter-current reflux molecular distillation

U.S. CHEMICAL EXPORTS

CHEMICAL exports from the United States in 1947 may reach an all time record total of $700,000,000 if shipments continue at the rate prevailing during the first quarter of the year, reports the American Chemical Society. This total would represent an increase of 40 per cent over 1946 and would be more than four times the figure for the last pre-war year. The tremendous rise in dollar volume, however, does not necessarily reflect a similar expansion in tonnage shipments since prices also have gone up in the last year.

The foreign demand for American chemicals has been principally for coal-tar products and medicinal chemicals, which have shown a seven-fold increase in export volume since 1939. One reason for this development is that importers of American goods are running short of dollar credits, and therefore tend to purchase only materials which can be used in the manufacture of exportable goods and necessities not available at home. Another factor contributing to America's position as the world's leading supplier of chemicals is the fact that she has fallen heir to many of Germany's former markets with the result that a tenfold increase has been noted in the demand for American dyes since 1939. This has caused the export total for coal-tar products to soar, despite shortages of benzene and phenol.

Belgium imported $2,809,000 worth of coal-tar products from the United States last year, thus doubling her 1939 purchases, while France increased her imports fivefold, although her dye output is down to about half the pre-war level. Switzerland, now an established exporter of dyes, imported American coal-tar products worth $4,093,000 in 1946 as compared with $80,000 worth in 1939, when Germany was her principal source of supply. India, whose imports of American coal-tar products were negligible in 1939, in 1946 made purchases totalling $8,282,000. South American republics formerly largely dependent on Germany, increased imports from the United States five-fold to $7,368,000, while Canada, a steady customer of the United States, bought $7,500,000—twice her 1939 volume.

Although the world-wide shortage of dollars is the principal factor limiting United States export trade in chemicals, import restrictions in foreign countries and two-way reciprocal trade pacts between European nations are also said to constitute obstacles. Furthermore, increased production in the British and United States zones of Germany may soon offer United States chemicals and drugs some competition.

GERMAN OIL FIELDS

THE recent Dutch claims on German territory adjoining the border has attracted attention to the oil resources in the disputed area. In December the production of the fields in the area of the Ems-river averaged 53,000 tons a month. By March of this year, however, the figure had gone down to 39,000 tons. The three "Emsland" bore-holes of the Wintershall and Elwerath companies yielded last year 79,870 tons. The Fuhrberg-Hambuhren district, operated by Wintershall and Brigitta-Companies, produced 51,000 tons. At Wietze where the oil is mined output reached 22,116 tons.

The following companies participated in the production of oil in Western Germany: Deutsche Vacuum Ol A.G., in Hamburg (U.S.-owned); Gewerkschaft Brigitta (Shell & Standard Oil); Preussische Bergwerks A.G.; "Preussag," Schachtbau-G.m.b H. at Salzgitter and Braunschweig G.m.b.H., formerly State-owned enterprises; C. Deilmann G.m.b.H., Bentheim, Deutsche Erdöl A.G., "Dea" Wintershall A.G., Celle, Itag A.G., Celle; Siep & Co., Cologne, Ritz & Co., Hamburg, Wietze-Gewerkschaft Elwerath, Hanover (all privately owned).

(Continued from p. 265)

new type of molecular still was designed in which a number of single-stage stills were so connected that recombination of fractions takes place automatically by gravity feed. In this way a separation that would have required 55 individual and recombination distillations was obtained in one step with a 10-compartment still, while the quantity of mercury required was enormously reduced.

The multistage molecular still consists of a series of evaporating surfaces, or pools, set adjacent to each other, but at slightly different levels. A cooled roof directly above each pool serves to condense the vapour. The roofs are so sloped that the condensate will run along the surface to fall into the adjacent cell higher up. Each pool is equipped with a spillover, which allows liquid to run back in amount equal to the condensed vapour carried forward. The overall operation is such that the light fraction increases in concentration toward the upper end, while the heavy fraction increases in concentration toward the lower end of the still.

Apart from a great saving in time, labour and materials through use of this still, the operation can be made continuous; the material to be concentrated can be fed into the system at one end or at the midpoint, if both light and heavy fractions are of interest; and the concentrate can be withdrawn continuously and the entire operation can be run without exposing the material to the atmosphere.

THE ROYAL INSTITUTION*

Contributions in the Physical Chemistry Field

by PROFESSOR ERIC K. RIDEAL, D.Sc., F.R.S.

IN celebration of the centenary of The Chemical Society, I was asked whether I would give a lecture under the somewhat formidable title of "The work of the Royal Institution in Physical Chemistry in Great Britain." According to the statutes, the Royal Institution is a foundation "for the promotion of science and the diffusion and extension of useful knowledge." It is best known throughout the world as the place where Michael Faraday lived and worked. It was, indeed, Faraday who imparted to the Institution its peculiar characteristics which combine those of an academy, a club and a research institution.

Distinguished Figures

Research in chemical matters in the Royal Institution may be said to have commenced with the appointment of Humphrey Davy in 1801 as lecturer in chemistry, and shortly afterwards as Professor, the first of the Resident Professors. Faraday was appointed first Fullerton Professor of Chemistry in 1833 and had as his successors in this Chair Odling, of Oxford (1868), Gladstone (1874), Sir James Dewar (1877), Sir William Bragg (1923), and Sir Henry Dale (1942).

Other Professors of Chemistry have been W. T. Brande and Sir Edward Frankland, while the Professors of Natural Philosophy who have extended our knowledge of physical chemistry by experimental work in the Institution include Thomas Young, John Tyndall and Lord Rayleigh. No less than five of the Professors in the Royal Institution have been Presidents of the Chemical Society.

It is evident that many lectures would be required to encompass the contributions to science of Michael Faraday alone, while those of both Davy and Dewar were remarkably extensive. I cannot do more than point out some of the more important physico chemical investigations which have interested a number of workers, including not only the professors I have mentioned, but others who came to work in the laboratory.

It is, for example, interesting to note that the founder of the Royal Institution, that remarkable American Benjamin Thompson, afterwards Count Rumford, included in his investigations not only the mechanical equivalent to heat, but also the principles of thermal isolation and of reflection and radiation of heat. Sir Humphrey Davy published a number of papers on radiant heat and Thomas Young, who was Professor of Natural Philosophy at the time, developed the undulatory theory of light and interpreted the phenomena of optical interference. Later, Tyndall in his study of the diathermancy of gases and vapours contributed much to our knowledge of the infra-red and to the scattering of light by particulate matter, and, as is well known, Lord Rayleigh's Interferometer is now one of the most important of our physico-chemical instruments.

The Rayleigh laws of light-scattering are now being applied to the determination of the size and shape of disperse matter, especially polymers. This work on radiation was followed by that of Sir Joseph Petavel on the measurement of the intensity of radiation at high temperatures, the determination of the melting point of platinum and the development of the bolometer.

Liquefaction of Gases

Another interesting case of continuity of work is to be found in connection with the phenomenon of condensation and liquefaction, starting with Davy's interest in this problem which resulted, as we well know, in the liquefaction of chlorine by Faraday, who subsequently succeeded with other condensible vapours and gases. Faraday failed to liquefy the more permanent gases, but this work was taken up with great success by Sir James Dewar. It must be pointed out that Dewar's work on low temperatures included the determination of specific heats at low temperatures, the absorption of gases by cool charcoal and other absorbents, and the principles of thermal isolation, all of which have had important consequences. It is not clear whether Dewar was the first to make use of the hot-cold tube method used so successfully by his contemporary St. Clair Deville and afterwards by Neunst and Wartenburg, but he describes the thermal formation of ozone by this method.

The work of Davy on Electrochemical decomposition, which founded the modern electrochemical industries, was, as we know, followed by the quantitative work of Faraday, resulting in the fundamental laws of electrolysis. Dewar contributed work on the reactions in the electric arcs and in the silent electric discharge. His work on nitrogen fixation in the form of hydrocyanic acid and cyanogen is worthy of note.

It was in the Royal Institution that Rayleigh's classical investigation on the densities of gases and isolation of argon was carried out. The thermal formation of nitric oxide was not the least important part of this work. Cuthbertson's determination of the refractivities of the rare gases and Wahl's optical investigations on solidified gases were likewise carried out there. Davy's work on fire damp, resulting in the miner's lamp, finds application to-day in the construction of explosion barriers. It is also worth recording that Davy made the first photographic (profile) prints.

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* From a lecture given during the celebration of the Chemical Society's Centenary.

40 Years of Faraday

Faraday's active experimental life extended over a period of some forty years and during that period no less than fifteen major investigations were undertaken, each of them having a profound effect on physical chemistry as we know it to-day. It is worth setting these down. They were: 1820, alloys of steel; 1821, electromagnetism, magnetic rotation; 1823, liquefaction of Cl_2 and other gases; 1825-6, isolation, analysis and sulphonation of benzene and naphthalene; 1825-9, optical and heavy glass; 1831, vibrating surfaces and magneto electricity; 1834, electrochemical laws, electricity in the Voltaic pile and catalysis; 1837, frictional electricity, specific inductive capacities; 1845, magnetism; 1849, diamagnetism and light, magnetism of flame and gases; 1851, colloidal gold; 1860, regelation of ice.

It is quite probable that Tyndall, when studying the moulding and flow of ice, had Faraday's work in mind. Tyndall's work on glacier movement forms the basis of the modern treatment of this subject, and Barnes extended our knowledge of the crystal structure of ice in the same laboratories. We must also note that Dewar was interested in the flow of substances under pressure, but made no notable contribution to the subject, except to record the effect of high hydraulic pressures on many chemical substances.

Gladstone made a number of important contributions to our science. His early work consisted in evaluating the molecular refractions of a number of compounds from which he, together with the Rev. Dale, defined the concept of atomic refraction and compiled the first table of this physico-chemical property.

He likewise, in his development of this well-known zinc-copper couple, made a number of important observations such as that there is scarcely any liberation of hydrogen when magnesium is brought into contact with pure water, but on addition of a trace of a copper salt, a vigorous reaction sets in. He published a number of illuminating drawings of the form of silver crystals growing from silver nitrate to which copper had been added, and of tin growing from stannous chloride in the presence of zinc. He showed, furthermore, that the zinc-copper couple would not only decompose water, but also the organic halides, and describes zinc ethyl as spontaneously inflammable.

Dewar carried out a series of experiments which at that time were important in establishing the principles of reversibility. Together with Scott, he determined the vapour densities of sodium and potassium and the vapour densities and dissociation of hydrazine hydrate and mercuric cyanide.

W. J. Russell worked on the theory of the photographic plate within the walls of the Davy-Faraday laboratory, his Bakerian lecture of 1898 was devoted to this subject. It is significant that Clerk Maxwell in a "Friday Evening Discourse" in 1861, adopting Young's theory of colour vision, showed the first three colour photographs of a piece of ribbon; this formed the basis of the three-colour process. Other early workers in physical chemistry include Sidney Young on fractionation, George Senter on electrolysis and hydrolysis rates, Wildermann on photo-voltaic effects, and Tizzard on hydrolysis.

If the determination of atomic weights is to be included under the title of physical chemistry, the Royal Institution is well represented by the fifteen communications of Alexander Scott on this subject which included carbon, nitrogen and tellurium and the combining ratio of carbon monoxide and oxygen.

With the advent of Sir W. H. Bragg the Davy Faraday laboratory became the centre of research in X-rays and crystal behaviour and there are few Universities in this country where the torch of this learning has not been carried and where it is still furiously burning. Other workers in the laboratory during this period included Astbury, Bernal, Caspari, Childs, Cox, Gibbs, Miss Knaggs, Mrs. Lonsdale, Mattieu, Robertson, Robinson, Shearer and Weiss.

24 Years of Muller

In conclusion I must mention the name of Alexander Muller. Muller was admitted to the Davy Faraday laboratory in 1923, and during the past twenty-four years has pursued his work on the application of X-rays. He will be especially remembered by chemists and physicists for his now classical work on the measurement by X-rays of long chain compounds, and by engineers and designers for his development of the spinning target generator. In the laboratory a 50 kW machine is a memorial and witness to his great skill both as a designer and experimentalist. Those who knew Muller had a great affection for him. If ever a worker had absorbed the spirit of the Davy Faraday laboratory of the Royal Institution it was he.

SYNTHETIC PRODUCTION OF PETROLEUM—II

The Fischer Process

by MAJOR KENNETH GORDON

THE Fischer process consists of passing carbon monoxide and hydrogen over a catalyst at relatively low temperature and at relatively low pressure. The reaction is one between carbon monoxide and hydrogen with elimination of the oxygen as water. There is a very considerable evolution of heat, and hence of course the process has inherently rather a low thermal efficiency.

A big chemical engineering difficulty in the process is the disposal of this quantity of heat without allowing the temperature of the gases to vary from the optimum by more than a very few degrees. The volume of catalyst required, particularly at atmospheric pressure, is very high, and its upkeep and replacement form a very substantial item of the cost.

Some of the newer German plants work at about 15 atmospheres pressure, but the results were very little different from those operating at low pressure. The German capacity for the Fischer process was not enlarged during the war and it was maintained at about 500,000 tons a year.

The type of converter design employed by the Germans consisted of a very large number of finned tubes embedded in the catalyst mass, and water circulated in these tubes provided control of the temperature, and at the same time a considerable quantity of steam for use in the factory.

Fischer v. Hydrogenation Process

The Fischer process differs from the hydrogenation process in that, while the hydrogenation process provides if required one single product, that is to say petrol of a required specification, and no by-products, the Fischer process produces a wide range of by-products stretching from hydrocarbon gases at the one end to solid wax at the other. A typical distribution of the products of the Fischer process is:

14 per cent by weight of gaseous hydrocarbons
47 per cent by weight of light oil boiling in the petrol range
28 per cent by weight of distillate oils
11 per cent by weight of wax.

The pressure process gives more wax, and less light oils. The products are largely straight chain hydrocarbons and by changing the conditions can be obtained more or less olefinic. Petrol of this nature has a very low octane number—in the region of 50, and would in this country be completely unmarketable.

The middle oil fraction would by the same token have ignition properties making it suitable as a diesel oil. The Germans indeed used it as a blend with tar oils which have the opposite properties, and thus made available substantial quantities of diesel oil. Care must, of course, be taken to eliminate the wax when used for this purpose. The wax is not dissimilar from that available from petroleum sources except for its olefin content. It is particularly suitable for the manufacture of synthetic fats. This is of some little interest but it cannot be said that the product would be widely acceptable either in the form of soap or in the form of margarine in this country. It is this facility for making straight chain mono-olefins which renders the Fischer process of interest to the chemical industry as a provider of raw materials.

Similar Operating Costs

So far as can be ascertained by our studies in Germany, both the capital and operating costs were very similar to those for the hydrogenation process, the general opinion being that the Fischer process costs were a little higher. Having regard to the fact that the Fischer process makes a crude product which would require further treatment before marketing, there is little doubt that, as worked in Germany at least, the process would be substantially more expensive than hydrogenation. Any comparison must be treated with reserve because the products are so different and the processes are really complementary rather than competitive.

Some 70 per cent of the cost of the Fischer process is represented by the synthesis gas, the balance being the cost of the conversion section itself. This conversion section is certainly susceptible to very great improvement from the chemical engineering point of view. The fluid catalyst technique developed during the war in America is one possible solution of the problem, but there are others, and there is little doubt that considerable improvements can be made to the process as employed by the Germans. Both the Fischer and hydrogenation processes use a similar amount of coal per ton of oil, about 6 tons.

The synthesis gas, which accounts for about 70 per cent of the cost, is, of course, the mixture of carbon monoxide and hydrogen which is the raw material for the process. It is to the reduction of the cost of this gas that we must look chiefly for cheapening the cost of the process as a whole. Such an improvement would, of course, also produce a considerable reduction in the cost of the hydrogenation process.

In the Fischer process we require 11,000 cu.m. of synthesis gas per ton of product For a ton of motor fuel by the hydrogenation process we need from 1000 to 3600 cu.m. of hydrogen, according to the raw material used, and the product made. In the Fischer process some 70 per cent of the cost of the process is the cost of the synthesis gas; in the hydrogenation process the cost of the compressed hydrogen is some 40 per cent of the total operating cost.

Synthesis Gas Production

In Germany the synthesis gas generally made from water gas, which in turn was made by gasification of bituminous coal coke. An adjustment to the proportion of hydrogen was made either by subjecting some of the gas to reaction with steam in the presence of a catalyst by the well-known process employed on such a big scale in the synthetic ammonia industry, or by adding coke oven gas to the water gas generators during the make period. This provides additional hydrogen, partly from the hydrogen in that gas and partly by thermal decomposition of its methane content.

There was considerable development in Germany during the war in gasification processes but they were mostly operated in conjunction with hydrogenation plants and were entirely directed to the utilisation of cheap low-grade fuel, in place of bituminous coal coke.

Many of these processes employ oxygen. Our studies of them have revealed little of direct application or interest to British conditions. A new process for gasification is one of the things we must look for in order to cheapen the cost of any method of making synthesis gas.

In countries where natural gas is available, as for example in America, there is already a very cheap process available for the manufacture of synthesis gas—the so-called methane steam process. In this process the hydrocarbon gas is mixed with steam, purified from sulphur, and passed over a nickel-containing catalyst at about 700°C. Under these conditions a mixture of carbon monoxide and hydrogen is produced containing less than 1 per cent of hydrocarbons. The process is very economical and simple, and has a thermal efficiency of about 74 per cent. It has been employed in this country in conjunction with the hydrogenation process to make part of the necessary hydrogen from the surplus hydrocarbon gases. The methane steam process was considerably developed in America during the war, on designs based on information supplied by us, for the manufacture of synthetic ammonia.

German Alternative Process

The Germans, for some reason, employed this process at only one of their factories, that at Pölitz. They were developing an alternative process in which the heat is provided by partial combustion of the hydrocarbon gases with oxygen. The special steel tubes necessary for the furnace are eliminated, but an oxygen plant must, of course, be operated. Our studies in Germany did not reveal that any great economic advantages could be expected from this development.

The schemes for the cheap production of petrol from natural gas in America, which have given themselves some little publicity lately, seem to utilise some such process for the production of their synthesis gas. Unfortunately, in this country we have no large sources of natural gas available. We are, therefore, driven for our developments to work out some new process, more economical than the present, for the production of synthesis gas from coal.

Official Notice

Petroleum-Bisulphide of Carbide

The Home Secretary has made an order varying Regulation 12 of the Bisulphide of Carbon (Conveyance) Regulations, 1935 (c) which provides that if electric lighting is employed on a tank wagon in which bisulphide of carbon is being conveyed by road the pressure shall not exceed sixteen volts. The maximum permissible voltage pressure has now been raised to twenty-four.

India's Chemical Imports

During the half-year ended September 30, 1945, India imported chemicals (including drugs and medicines) to the value of Rs.5 Crores (£4 millions), the figures for the same period of 19946 being Rs.6 Crores (£5 millions). Imports of dyes and colours for the same two periods were Rs.4 Crores (£3 millions) and Rs.5 Crores (£4 millions).

Argentine Import Rates

Circular No. 802 issued by the Argentine Central Bank on July 16, modifies the rates of exchange for imports of insecticide for flies (liquid in drums), concentrated denominated DDT liquid insecticide, insecticide for locusts, and peroxide and borate of manganese.

PLASTICS FROM THE PETROLEUM INDUSTRY

THE constant changes attendant upon developments in the field of plastics, and especially in the utilisation of new raw materials, cannot fail to produce repercussions over a wide range of industries, particularly in those cases where plastic manufacturers have transformed erstwhile waste products into promising raw materials. In other directions it may be possible to find new uses for by-products, and eventually lead to revision of processing methods. The change of emphasis in plastics manufacture from the employment of cyclic resins, largely a product of the coal-tar industry, to acyclic resins, most of which can be produced from petroleum derivatives, comes at a time when serious attention is already being focused on petroleum as a source of supply for a whole series of much used chemicals.

Plastics for the Oilfields

At the same time come reports of developments in an opposite direction. From petroleum, which constitutes an important raw material for the production of plastic products, the wheel of progress turns full cycle, with news of plastic products carving out for themselves a prominent position in the realm of oilfield equipment. Such plant, by the very nature of the operations in which it is employed, is called upon to withstand conditions necessitating frequent replacements with a consequent hold-up in production. Crude oil as pumped up from the wells contains salt water and sulphur, both of which have markedly corrosive effects on the pipe-lines. In addition, the crude oil leaves a coating of paraffin wax on the inside of the pipes thus restricting delivery rate as well as necessitating expensive scraping operations. These cannot be undertaken without prejudice to the protective oxide coating and so accelerating active corrosion. The removal of water and entrained oxygen by means of de-aerators has proved too expensive, while most corrosion inhibitors present difficulties owing to their tendency to react with the petroleum, a striking exception being sodium nitrite, which has proved effective in a number of cases.

New Thermosetting Materials

Laboratory work extending over a considerable period has resulted in the evolution of a phenol resin-derived thermosetting coating material which may well be regarded as one of the main weapons against corrosion in the petroleum industry. The product is a "tailor-made" compound which by the inclusion of appropriate pigments, plasticisers and solvents, provides the maximum protection against corrosion; assures flexibility and confers a marked resistance to the deposition of paraffin wax. Early difficulties in bonding of the plastic coating to the metallic base, *i.e.*, blistering and subsequent loosening, were overcome by introducing a pre-coating treatment comprising pickling, degreasing, rinsing and shot-blasting. Several coats of the plastic material are then applied to the pipes in specially constructed ovens at a temperature of 300°F. A final baking at 450°F. completes the process.

Longer Life—Less Maintenance

Experience has proved that plastic coated lines have a much longer life and call for much less maintenance than those pipe lines not so treated. Equipment located in such a way that it cannot be readily examined, has been tested for signs of corrosion by passing water through it. The water upon emerging was found to have no iron content. The value of this assurance with equipment so positioned has only to be mentioned to be appreciated. In the case of materials exposed to the corrosive action of salt water, results obtained can only be described as spectacular. Equally successful has been the employment of this plastic coating in the chemical products section of petroleum plants; a good example of the service of equipment so treated,is to be found in fittings and pipes exposed to the action of sulphur and of aluminium chloride at high temperature. While untreated equipment called for replacement at the end of 14 days, plastic coated units were still serviceable after a period of nine months. Paraffin deposition on the interior of pipes has been largely eliminated by the smooth surface of the plastic coating.

Storage Tank Preservation

A similar process employing a chemically inert thermoplastic liquid resin has proved effective in the preservation of oil storage tanks exposed to the severe corrosive conditions occurring in the storage of crude oil. The preparation of the surface to be treated is again important, cleaning and sand-blasting being necessary in order to provide a suitable surface. The liquid coating may be applied by brush, dip, or spray (four coats are necessary) the whole process taking from 2½ to 4 days according to the nature of the preliminary treatment.

The coating so applied remains in a semi-plastic state, and forms a firm bond to metal, clean, unpainted wood, or to concrete. Tanks treated in this manner can be steam-treated without injury, but prolonged exposure to temperatures above 180° F. should be avoided. Paraffin wax will not cling to surfaces so treated while electrolytic and bacterial action are arrested. While prolonged exposure to most acids and alkalis at normal concentrations has no effect, aromatic hydrocarbons and chlorinated solvents have a softening effect.

Turning from storage tanks, which may be considered as items of a final process if refining is disregarded, plastics have also been recently employed in the initial operations of well sinking and soil consolidation. Used in this capacity, plastics are thermo-setting materials with a specific gravity approximately equal to that of water and are dark brown in colour. The temperature range at which these plastics set extends from 50° to 350° F.; the state of solidification attained after being placed in the well is governed by the temperature at which the plastic is applied, pressure having no effect. It is essential therefore that the temperature at the working depth be known within very close limits. The actual time required for solidification can be controlled by the action of catalysts which have no effect on the physical properties of the plastic after setting. An average setting time is eight hours.

The foregoing developments represent one aspect of a reversible cycle; plastics and petroleum, petroleum and plastics. Future advances in both directions are awaited with interest.

NEW SWEDISH IMPORT REGULATIONS

Additions and Deletions to "Free List"

THE "Free List" of goods, *i.e.*, those not requiring licences on importation into Sweden has been amended by a Swedish Royal Proclamation dated July 10, its terms becoming operative from July 27 last.

Goods which until July 27 were on the "Free List" but have been deleted, may be imported without licence provided they had been loaded for direct shipment to Sweden before August 2 or had been paid for in full before the new list came into force.

Deletions from the "Free List" are as follows:

SECTION V

Mineral and Fossil Products

Asbestos, bauxite, gypsum, emery, carbolic acid and cresol.

SECTION VI

Chemical and Pharmaceutical Products; Colours and Varnishes; Perfumes, Soaps, Candles and other articles manufactured with oil, fat and wax; Glues and gelatine; Explosives; Fertilisers

Glycerine, potassium hydrate (caustic potash), sodium hydrate (caustic soda), calcium chloride, wood spirt, (methanol), esters derived from phthalic acid, *n.s.m.*, lamp black, and similar black colouring substances, *n.s.m.*, cobalt oxides.

SECTION XV

Non-Precious Metals and manufactures therof

Iron alloys and silicate.

SECTION XVI

Machines, Apparatus and Electrical Plant

Steam boilers, heaters, *n.s.m.*, tanks and furnaces, fitted with mechanical appliances, provided that these articles chiefly consist of malleable iron; manufactures of rolled iron plate for boilers; furnaces for steam boilers and gasworks; grates for such apparatus; economisers and parts thereof; ovens for industrial purposes, also forges and bellows; rolling mills for the metal industry, steam hammers, pneumatic hammers, spring hammers, rams, pumps and separately imported outer coverings and inner rotating parts thereof, centrifuges, *n.s.m.*

SECTION XX

Goods not mentioned elsewhere

"Bakelite" and other artificial resins intended to be pressed, capable of hardening or hardened, also manufactured of these materials, *n.s.m.*, even containing paper, textile materials and the like: plates and tubes; "Celluloid," "Cellone," "cellophane," "gaudafil," "galalithe," "ambroin," "eburin" and other similar artificial plastic materials not classified under any other heading: unwrought, also cellulose acetate.

Additions are as follows:

SECTION V

Mineral and Fossil Products

Felspar, graphite.

SECTION VI

Chemical and Pharmaceutical Products, etc.

Selenium, bromine, iodine, arsenic, phosphorus hydride, carbon sulphide, sulphur, chloride, phosphorus sesquisulphide, potassium and sodium sulphide and lepar sulphuris, ethylene oxide with or without admixture of carbonic acid, fast dissolving re-agents constituting products for the sulphurisation of carburetted hydrogen or of fat, oxalic acid including potassium sodium and ammonium oxalates, sodium acetate, chrome, iron and cobalt acetates, lead acetate (sugar of lead) and lead vinegar, manganese dioxide, ammonium chloride, tin salt, tin chloride and tin oxide, bromides and iodides of metal or ammonium not referred to elsewhere, nickel sulphate and nickel ammonium sulphate, sodium sulphite, potassium nitrate, sulphoxylic acid salts or hydrosulphurous acid salts combined or not with formaldehyde, acetone and the like. *Add* the words "and liniment" after "druggists' goods." Animal charcoal and bone black, siccatives consisting of metal compounds of fatty resinic or napthenic acids.

F. Glues, Gelatine, etc.

Roller, autograph and hectograph 'compositions, including manufactures thereof.

BELGO-DUTCH AGREEMENT

Free Fertiliser Exchange

UNDER the terms of the 1944 Customs Agreement signed between the Belgo-Luxembourg Economic Union and the Netherlands, and the interpretative Protocol signed in March of this year, provision is made for the application of a common customs tariff for imports of goods into the territories of the contracting parties. Section VI—Chapter 35 of the agreement provides for the free exchange of the following fertilisers: (1) potassium nitrate (unrefined), (2) ammonium phosphate, (3) potassium phosphate, (4) compounds with a base of ammonium nitrate or ammonium chloride, and, (5) other fertilisers not specified or included elsewhere.

American Chemical Notebook

From Our New York Correspondent

THE Bolivian Ambassador to Washington, Ricardo Martinez Vargas, this week predicted that if the United States wants more of his nation's tin she will have to pay more than the present price of 76 cents a pound. At the present time discussions are being held in Washington between Ambassador Vargas and Norman Armour, Assistant Secretary of State, for the purposes of negotiating a new contract; it is not expected to be concluded before the end of next month.

Existing arrangements between the United States and Bolivia, provide for the former to receive 12,000 tons of Bolivian tin with the balance of the latter country's output going to Great Britain and Argentina. According to Ambassador Vargas, the new contract will enable the United States to obtain a larger proportion of Bolivia's tin for which she will be willing to pay an increased price.

* * *

A new organic chemical, not previously disclosed in the literature, 2-Mercapto-4, 6,6-trimethyl thiazine (M.T.M.T.), was announced this week by S. L. Broas, manager of the new products department of the B. F. Goodrich Chemical Company, Cleveland, Ohio. M.T.M.T. is a yellow, crystalline material, insoluble in water but soluble in ketones and esters. Heterocyclic in nature, it reacts as a tautomeric compound with the active hydrogen atom shifting from sulphur to nitrogen as the reaction conditions are changed. Esters, metal salts and other derivatives are prepared readily and in good quantities. M.T.M.T. is easily dimerised, the dimer itself being quite reactive.

As an intermediate, the new organic chemical is expected to be used extensively in the manufacture of wetting agents, pharmaceuticals and other chemicals. A detailed technical bulletin and samples are available upon written application to the New Products Department, B. F. Goodrich Chemical Company, 324 Rose Building, Cleveland 15, Ohio.

* * *

Following an extensive study of patent literature in connection with an investigation in the field of powder metallurgy at the United States National Bureau of Standards, a comprehensive list of powder metallurgy patents has been compiled and is now available. Representing more than a century of progress this valuable source of technical information, which was obtained from a collection search of 2253 patents, has been classified into related groups with a short abstract for each invention.

Published technical literature relating to this field, of comparatively new and undeveloped science, is widely scattered, making it difficult for metallurgists to keep abreast of developments. For this reason, the National Bureau of Standard's listing and analysis of the patent literature classified according to production, handling and working, alloying and application, should prove useful to those engaged in research and development in powder metallurgy. The publication, NBS number M184, *United States Patents on Powder Metallurgy*, by Raymond E. Jager and Rolla E. Pollard, is available from the Superintendent of Documents, Washington 25, D.C., 30 cents each.

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While the unconjugated diolefinic hydrocarbon, vinyl cyclohexane, has up to now been available only in laboratory quantities, in future it will be available in commercial quantities, states an announcement by the chemical division of the Koppers Company, Pittsburgh, Pa. Although the new material is still more or less in the course of development, Koppers is making it commercially available because it appears to be a useful materials for the production of synthetic organic chemicals by virtue of the fact that its chemical structure is such that it can undergo a wide variety of chemical rections. Furthermore, since it does not polymerise readily, it may be stored under normal conditions. The finished product contains no inhibitor.

* * *

A chemical safety data sheet on aqua ammonia, setting forth important physical and chemical properties of the product and offering suggestions for the safe handling of the chemical has been issued by the Manufacturing Chemists' Association of the U.S. as the thirteenth in its series of chemical product safety manuals. Its title is SD-13—*Aqua Ammonia*—and it is available at 20 cents per copy from the Association's office at 608 Woodward Building, Washington 5, D.C.

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This week ground was broken at Niskayuna, New York, for the $20,000,000 Knolls Atomic Research Laboratory* which will be built under the supervision of the U.S. General Electric Company for the United States Atomic Energy Commission.

The first shovelful of earth at the site of the new laboratory, which overlooks the Mohawk River, was turned by Dr. C. G. Suits, vice-president of the General Electric Company, who will direct the new laboratory, fifth in a series being established by the Atomic Energy Commission.

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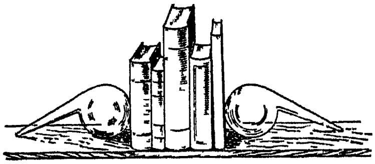
* A preliminary note together with an artist's impression of the new laboratory appeared in *The Chemical Age* (p. 321) of March.



A CHEMIST'S BOOKSHELF

British Science News, published by Science Department, The British Council, London, W.1, is a new publication, replacing the hitherto Monthly Science News. It will be a larger edition and will contain some longer and more specialised authoritative articles besides some book reviews and other items of general interest such as particulars of British Scientific Conferences. The first number which has just appeared is a special chemistry issue of the Centenary Celebrations of the Chemical Society. Although this first number deals mainly with the history and development of chemistry, future numbers will not be restricted in scope, but should appeal to the general scientific reader.

Thorpe's Dictionary of Applied Chemistry. Fourth Edition, Volume VIII. Meth-Oils, Essential. Longmans, Green and Co., London 1947. Pp. 679. Price 80s. net.

The present volume of this dictionary, inaugurated by the late Sir Edward Thorpe and now being published under the experienced editorship of M. A. Whiteley, follows on the traditional lines laid down for the previous volumes. The long list of contributors comprises well-known names of university scientists and experts in the employ of industrial concerns notable in particular fields of specialised knowledge. It is always welcome to find a close and cordial contact of universities and industry. Thus the names of the various writers and the established standard of the book are sufficient guarantee of its general excellence, comparable, for instance, with Beilstein's Handbook of Organic Chemistry.

The new edition can be regarded as an entirely remodelled and up-to-date version of the last issue and the various subjects are dealt with in a manner justified by the advancement during the period that has intervened since the last edition was published in 1927 with supplementary volumes up to 1936.

The articles of the book, beginning with Methal and ending with Essential Oils, are written with special minuteness of detail, and signed by famous authorities. The "dictionary" style, however, has been maintained throughout. The monograph on Methylanthracene and other Substituted Anthracenes (by R. F. Thomson), covers 35 pages with literature references as far back as 1869, and the article (by the late W. F. Boston) on Michochemistry, divided into three distinct sections, deals with the use of "drop-reactions" in inorganic qualitative analysis, selected microchemical manipulative methods, and organic microanalysis respectively. Milk is dealt with by J. H. Bushill and H. S. Rooke and contains 15 tables on Dairy Science. Mineralogists will be interested in the monograph on Minerals and X-Ray Analysis (by F. A. Banister) with many tables compiled from the literature to give an alphabetic list of crystal structures, as well as in the chapter on Geochemistry of Minerals (by V. M. Goldsmith and A. Muir). The article on Molecular Spectra, Visible and Ultraviolet (by R. A. Morton), will commend itself as a comprehensive treatise. E. H. Rodd and Colleagues of the I.C.I. Manchester, sign the very full monographs on Naphthalene and its Derivatives (pp. 263-438) and A. E. Hanson of the Mond Nickel Company wrote the articles on Monel and Nickel. Mention should also be made of the monograph on Nitrogen-often quoted as the element of the future (by J. H. Quastel, pp. 594-620) and finally on Oils, Essential (by T. H. Durrans).

The inclusion of an accurate index by Dr. J. N. Goldsmith is most welcome and makes the book so much more handy for the general chemist and the expert alike. The work as a whole when completed will be the most useful, even indispensable up-to-date encyclopædia of applied chemistry.

FAITH IN THE FUTURE

W. J. Bush Chairman's Confidence

Dr. Percy C. C. Isherwood, chairman and managing director of W. J. Bush, and Co., Ltd., spoke confidently of Britain's future when he addressed the 50th annual general meeting of the company in London recently. He concluded his remarks by saying:

"I would like to close these remarks with an expression of faith. Our national history shows that this old country has great resilience and recuperative powers. To this the fine chemical industry and its ancillary activities are no exception."

Home News Items

Address Change.—Spillers Central Laboratory (Spillers, Ltd.) will function at Station Road, Cambridge as and from August 28.

July Steel Output Lower.—Production of steel ingots and castings during July was at an annual rate of 11,007,000 tons, a figure that compares with 13,206,000 tons in June, and 11,759,000 tons in July 1946.

Cheaper Quicksilver.—Mercurio Europea, the Italo-Spanish quicksilver group, has reduced its U.K. selling price from £17 3s. 6d. to £16 per flask, ex warehouse, London. The c.i.f. U.K. quotation, formerly £16 12s. 6d., is now £15 8s.

B.B.C. Publicity for E. M. & F. Exhibition.—B.B.C. broadcasts on the North American, African, General Overseas Services have recently been given to publicise the Engineering & Marine and Foundry Exhibition to be held at Olympia from August 28 to September 13.

Fertiliser Society Meeting.—The Fertiliser Society is to hold a meeting on October 10 at the Lecture Hall of the Royal Society of Tropical Medicine. An address entitled "Granulation of Phosphatic Fertilisers" will be given by Mr. Sven Nordengren, a well-known Swedish chemical engineer.

Petroleum Board Ends.—The Ministry of Fuel and Power has announced that the Petroleum Board will cease to function as from December 31 next. For the time being control of prices and imports will remain with the Ministry, but the various marketing companies will resume distribution of branded petrol on their own account.

Change of Address.—British Industrial Solvents, Ltd., have acquired new premises to house their entire head office staff, and are accordingly closing their evacuation office at Belmont, Surrey. As from August 15, 1947, their only London address has been 4, Cavendish Square, London, W.1. (Telephone: Langham 4501), to which all communications should be sent.

Plastic Wood.—Claiming to have produced, with the aid of a German refugee scientist, a new plastic-type material of special industrial value derived from the action of bacteria on wood flour, Thomas Gordon, a Baillie of Anstruther, Scotland, has opened offices to exploit the process, at Princes House, Piccadilly, London, W. Said to have been the product of 12 years' research, the new plastic wood can be moulded, turned or machined in any way and may prove to be a valuable timber substitute.

Decontrol of Soft Drinks Industry.—The Minister of Food has approved a plan to deconcentrate the soft drinks industry put forward by the Soft Drinks Industry (War Time) Association. It will come into operation on October 12.

Mineral Water Factory Re-opened.—The mineral water and pure malt vinegar factory of W. Ganson & Co., Cornaro Works, Hove Edge, Halifax, which was closed under war conditions in February 1942, has been acquired by Messrs. J. Scott and J. Sidey (of Bolton Direct Supply Co.).

Social Conditions in Britain.—A course arranged by the British Council and entitled "Social Conditions in Industrial Britain" was held in Birmingham from July 26 to August 16. It was attended by 21 social workers from Czechoslovakia, Finland, France, Hungary, Italy, Norway and Sweden.

Change of Ownership.—A group under the leadership of Industrial, Finance and Investment Corporation has acquired a controlling interest in Minerals Separation, Ltd. No change of management of the company is involved, and the board further announce that Minerals Separation has bought an interest of over 90 per cent in Howard Pottery Co., Stoke-on-Trent.

New Uses for Nylon.—Nylon rope and cordage are being utilised for industrial and commercial purposes following their successful use during the war years. The products possess self-recommending rot-proof and fire-proof qualities. British Ropes, Ltd., who have begun a campaign to familiarise rope and cordage users with these products, it is learned, will operate a demonstration van at principal British centres in the near future.

Death at Atomic Site.—A man was killed and another seriously injured when a concrete floor gave way beneath them as they were helping to clear the site for Britain's first atomic energy power station at Sellafield, Cumberland, on August 15. The floor, 160 ft. square, in a former Royal Ordnance factory, was dislodged when an iron girder slipped out of position, and it hurtled down in pieces and buried the two men.

Aluminium Replaces Timber.—Because of the timber shortage, the Northern Aluminium Co., Ltd., has adapted aluminium as a packaging material for its export consignments. The company is using aluminium "envelopes" with waterproof tarred liners, sealed and durable as containers for its export lots of sheet metal. Important economy of stowage space is an incidental merit of this new type of pack.

Personal

Mr. N. G. McCulloch, for 18 years a director of the Calico Printers Association, has been appointed deputy chairman.

Mr. Montague Temple has relinquished his directorship of the Standard Candle Company.

Dr. R. T. Colgate, works chemist to Messrs. Huntley and Palmers, has been awarded this year's Medal of the Society of Chemical Industry.

Dr E. B. Benger, director of the research laboratories at the Du Pont experimental station, has retired after 30 years' service with the company.

Mr. Henry Burns, of Messrs. Thomas W. Ward, Ltd., left Great Britain last week for New Zealand where he is to open and take charge of that company's new office there.

Dr. Sadgopal, formerly Technical Director of the Hindustan Aromatics Co., Naini-Allahabad, has been appointed Professor of Oil and Soap Technology in the Department of Industrial Chemistry at the College of Technology, Benares Hindu University.

Dr H. Roxbee Cox, the Ministry of Supply gas turbine expert, was decorated at a special investiture ceremony on Monday, August 18, with the American Medal of Honour with Silver Palm by Major General Clayton L. Bissell.

A presentation to mark his 50 years in the soap trade has been made to **Mr. John Fearnett**, of Port Sunlight, by Mr. G. A. S. Nairn, chairman of Messrs. Levers Bros. Mr. Fearnett began work at Runcorn in 1897, transferring to Port Sunlight in 1911.

Mr. K. J. Bolton (Lorilleux & Bolton, Ltd.) has been elected president of the Federation of British Printing Ink Manufacturers in succession to Mr. S. Cumbers. **Mr. E. Bowes** (Forrest Printing Ink Co., Ltd.) has been elected vice-president.

Mr. R. H. Ridler, one of a number of service representatives appointed to assist Dunlop distributors and users, has just left on an extended tour of the Caribbean area, including Colombia, Venezuela, Central America and Mexico in addition to Cuba and the British West Indies.

Mr. Edward Thompson, managing director of the John Thompson Group of Companies, returned last week from a six-month visit to Australian and South African subsidiary companies. While in Australia, he was instrumental in securing the contract for the new Yallourn power station which has a value in Australia of over £2,047,000.

Dr. Georges Proyard, head of the medical service of a big Belgian factory, who is just concluding a visit to Britain under arrangements made by the British Council, has been sent by his firm (the John Cockerill works at Seraing) to study British health services in heavy and chemical industrial factories; he is also interested in the prevention and treatment of accidents.

Mr. Ralph Credland, who has been appointed assistant managing director of the Widnes Foundry and Engineering Co., Ltd., has been principally responsible for building up the foundry to its present large scale of activity, a work he undertook, as general manager, shortly before the last war. He has rendered good service locally as member of the Advisory Committee of the Widnes Technical College.

An award of £3000, on half-share in a patent) to **Mrs. B. G. Mulhern**, of Merton Road, Bootle, has been recommended by the Royal Commission on awards to inventors. Mrs. Mulhern is the widow of **Mr. J. A. Mulhern**, whose invention in collaboration with **Mr. George Keenan**, Board of Trade surveyor, of Great Crosby, of an apparatus for distilling fresh water from sea water, has saved the lives of merchant seamen and aircrew at sea.

Dr. Boyes (Allen and Hanbury, Ltd.), **Mr. Hollies** (Boots Pure Drug Co., Ltd.), **Mr. Reid** (Evans Medical Supplies), **Mr. A. G. Fishburn** (I.C.I.), **Mr. W. D. Kemp** (May and Baker, Ltd.), and **Mr. Falder** (Wellcome Foundation, Ltd.) were present at a dinner given by the Pharmaceutical Society at the Holborn Restaurant recently in honour of seven Chinese students who had just graduater as Bachelors of Pharmacy. Each of the above-mentioned manufacturing houses, together with Glaxo Laboratories had " adopted " a student and had thus made possible the establishment of the scholarships.

Obituaries

Mr. James Bruce, past chairman of the Glasgow section of the Society of Chemical Industry and chief Glasgow representative of I.C.I. Dyestuffs Division, has died at the age of 62.

Mr. James William Brooks, manager of Sowerby Bridge sewage works, died on August 1 at the age of 60. He had been employed by Sowerby Bridge Council 40 years, and had been sewage manager for 28 years.

Major Victor Lefebure, who died last week at Golders Green, was an authority on chemical warfare having been a member of the Directorate of Gas Services on the Western Front during World War I. He served on the Civil Defence advisory committee on air raid precautions during World War II.

Overseas News Items

U.S. Ammonium Sulphate Price Up.—From the beginning of August, U.S. ammonium sulphate, f.o.b. ovens, was increased by 5 cents to 35 cents per ton.

French Supply Caustic Soda to U.S.A.—The U.S. scarcity in caustic soda has been slightly eased by the arrival of 375 tons of French supplies, with a further 2000 tons likely.

Mexico City Pipeline.—Petroleos Mexicanos, Mexico City, has built a 26-inch natural gas pipeline between Mexico City and Poza Rico at a cost of ten million dollars.

Underground Gasification.—A Belgian experiment to fire coal underground and conduct the gases to the surface where they will be used to drive electrical generators is to start in the Liége district early in September.

Higher American Fats and Oil Output.—According to the U.S. Bureau of Agriculture, production of oils and fats in the first six months of the current year exceeded that for the corresponding period of last year by some ten per cent.

Argentina's Paint Industry.—In order to utilise its large linseed output in pursuance of its comprehensive industrialisation programme, Argentina plans to erect a number of paint factories to supply products to both the home and overseas markets.

Vitamin A Produced Artificially.—Two Dutch chemists are reported to have discovered a method for preparing vitamin A by artificial means. The raw material is said to be a tropical grass normally used for the extraction of perfume.

New U.S. Caustic Soda Production Method. — The well-known Mathieson Alkali Co. announces that it is soon to licence a new sttionary mercury cell for the production of caustic soda at a lower cost than is possible with present methods. It is stated that works are being erected in Canada and in Latin America.

Protest to Hungary.—Four Soviet-Hungarian companies, namely the Hungarian-Soviet Bauxite and Aluminium Company, the Hungarian-Soviet Oil Works, Ltd., the Hungarian-Soviet Air Transport Company, and the Hungarian-Soviet Navigation Company, have been granted privileges inconsistent with the peace treaty, alleges a note received by the Hungarian Government from the British Government. The four companies concerned are said to be benefiting from certain tax exemptions, not at present enjoyed by British companies in Hungary.

Copper and Tungsten in Italy.—In Northern Italy copper deposits are reported to have been found near Bolzano (Bozen) and tungsten deposits in the valley of Fierme.

U.S. Chemical Worker's Wage Demands.—A "cost-of-living" increase of 23.5 cents per hour is being aimed at by the U.S. United Chemical Workers, an organisation forming part of the C.I.O.

New U.S. Chemicals Sales Company.—The Commercial Chemical Development Association, a new U.S. corporation, has recently been established to market chemical products.

Magnesite Deposits Discovered in Austria.—An occurrence of magnesite was recently discovered near Fieberbrunn, Austria, and a plant for its exploitation is to be erected at Hochfilzen.

Austrian Copper Production.—The Brixlegg mines in Austria, which had been almost completely destroyed in the final phase of the war, are reported to be producing again at an annual rate of about 5000 tons.

Russo-Polish Trade.—Under a new trade agreement signed recently in Moscow, Russia is to supply, among other goods, iron and manganese ores, ferrous alloys, oil derivatives and chemicals, in exchange for non-ferrous metals, and glass.

Special Cement Developed in Norway.—After many years of research, a Norwegian engineer, A. Daniels, is reported to have developed a new cement which is said to be highly resistant to water. A special metamorphosed limestone found in Sunnmöre, Norway, is mixed in to the cement.

Austrian Carbide Output Lagging.—The "Donauchemie," Landau, Austria's only producer of calcium carbide, is reported to be in a position to supply about 500 metric tons per month, but the lack of coal and of labour make it unlikely that the full capacity, i.e. 900 metric tons per month, will soon be reached.

New Chemical Plant for Brazil.—Because of delays in receiving machinery and equipment from the United States, construction of a chemical plant at Goiabal, near Volta Redonda, Brazil, intended for the production of explosives and sulphuric and nitric acids is progressing slowly. However, the plant, known as Industrias Quimicas Brasileiras Duperial, is expected to be in operation by the latter part of 1948. The plant is jointly owned by United States and British interests.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

CHEMICAL & INSULATING CO., LTD., Darlington. (M., 23/8/47.) Satisfaction July 8, £50,000, registered December 7, 1932.

TOWNSON & MERCER LTD., Croydon, chemical and scientific apparatus manufacturers. (M., 23/8/47.) July 15, charge, to Barclays Bank Ltd., securing all moneys due or to become due to the Bank; charged on land at Beddington Lane, Croydon. *£8403. May 4, 1946.

ASSOCIATED CHEMICALS, LTD., Richmond, Surrey. (M., 23/8/47.) July 17, £3610, £2650 and £1750 mortgages, to Abbey National Building Society; respectively charged on 2 The Green, Richmond, Surrey, and 2 and 4 Claremont Road, Teddington. *Nil. December 20, 1946.

Company News

The nominal capital of **Westminster Laboratories, Ltd.,** 7 Chalcot Road, Regents Park, London, N.W.1, has been increased beyond the registered capital of £10,000, by £40,000, in £1 ordinary shares.

The name of **South Wales Vapour Testing Company Ltd.,** Powell Duffryn House, Cardiff Docks, has been changed to British Vapour Testing Company Limited, as from July 8, 1947.

The nominal capital of **Ace Products (Manchester), Ltd.,** chemical manufacturers, etc., Hillside Works, Manchester Road, Wilmslow, has been increased beyond the registered capital of £2000 by £4000 in £1 shares.

International Bitumen Emulsions has announced a profit for the year ended March 31, of £46,569 as against £24,882 for the previous year. A dividend of 15 per cent is recommended, an increase of 5 per cent over last year.

Major & Company, chemical manufacturers, has reported a profit for the year ended March 31, of £18,983, as against the previous year's figure of £25,108. An ordinary dividend of 7 per cent is recommended, comparing with 6 per cent last year.

New Companies Registered

Stein, Branik & Stein, Ltd. (440,438).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in and agents for chemicals, gases, drugs, etc. Subscribers: S. H. Yeomans, and P. C. Evans. Secretary: Miss Edna Dufman, 28 Maddox Street, W.1.

Alfa Plastics, Ltd. (440,137).—Private company. Capital: £5250 in 5000 "A" shares of £1 and 5000 "B" shares of 1s. Manufacturers of and dealers in plastic and metal goods, chemicals, etc. Directors: E. C. Graham and G. A. Rohonczi. Registered office: 61 Mark Lane, E.C.3.

Mineralisation, Ltd. (439,949).—Private company. Capital £15,000 in 15,000 shares of £1 each. Industrial advisers and consultants, consulting engineers, research workers, processors of all types of fuel and their by-products, etc. Directors: L. Jones and M. Jones. Registered office: Crown Square, Matlock.

Hudson and Towle, Ltd. (440,089).—Private company. Capital £500 in £1 shares. Importers, exporters and manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Subscribers: F. F. Harmer, and S. Hyde. Secretary: W. H. French. Registered office: 21 Cardiff Road, Luton.

Southall Bye-Products, Ltd. (439,888).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals, drugs, medicines, disinfectants, fertilisers, etc. Directors: J. O'Rell, and S. J. O'Rell. Registered office: Dairy Meadows, off Havelock Road, Southall, Middlesex.

NATURAL MENTHOL

The Board of Trade in consultation with the Central Price Regulation Committee, has made an Order revoking the Natural Menthol (Maximum Prices) Order, 1943 (S.R. & O. 1943 No. 1285).

ECONOMY IN COPPER TUBES

The Ministry of Supply draws attention to the need for economy in the weight of copper used in hot and cold water systems in buildings, and stresses the importance of using copper tubes as laid down in British Standard Specification 659/1944. As from August 11 manufacturers have been requested to discontinue the production of any copper tubes which do not conform to this specification.

Chemical and Allied Stocks and Shares

EARLIER in the week support for short-dated stocks inspired a rally in British Funds and there was a strong outburst of speculative activity in gold mining shares as a refuge for money during the crisis. In contrast industrial shares remained out of favour with small irregular movements predominating. Yields on many industrials are now attractive and moreover in most cases there seems reasonable prospects of dividends being maintained if there is no serious fuel shortage; but on the other hand, the market feels that the outlook is obscure, particularly as the crisis may force another Budget in the autumn with new restrictions and controls.

Among chemical and kindred shares, Imperial Chemical were down to 44s. 6d., and Lever & Unilever at 48s. 9d. only made moderate response to the good impression created by the full results and annual review. Fisons changed hands around 58s., Greeff Chemical Holdings 5s. shares were 15s. 9d., W. J. Bush 90s., and B. Laporte 92s. 6d. British Glues & Chemicals 4s. ordinary at 20s. provided a relatively steady feature and in other directions, British Xylonite at £8⅜ were higher in anticipation of new capital plans. Major & Co.'s 2s. shares changed hands around 3s. 3d. following publication of the full results. British Aluminium receded to 42s. 6d., De La Rue were 47s. 6d., General Refractories 22s. 6d., British Oxygen 93s. 9d., and Borax Consolidated eased to 52s. 6d. despite the interim dividend. Elsewhere, Amalgamated Metal were 17s., Dunlop Rubber eased to 69s. 4½d. while awaiting the dividend anouncement, the units of the Distillers Co. changed hands around the lower level of 136s. 3d. British Plaster Board were 24s. 9d., and United Molasses 50s.

Iron and steels lost further ground, nationalisation uncertainty being increased by fears of trade union pressure on the Government. The fall of value in this section has been general and has included shares of many companies which in any case are regarded as being outside the nationalisation threat. Heavy engineering shares for example lost ground, and Babcock & Wilcox were 64s. 9d. United Steel have receded to 24s. 6d. Guest Keen were 41s. 9d., Dorman Long 25s. 6d., Stewarts & Lloyds 49s. 3d., Hadfields 22s. 9d., and Colvilles 25s. 4½d. Export trade hopes again helped textile shares which have been relatively steady, although Courtaulds came back to 46s. 3d. Gas Light & Coke eased to 20s. 4½d. reflecting reports that a Bill for nationalisation of the gas industry may be introduced in the next session of Parliament.

Triplex Glass have eased to 30s. 3d. on doubts whether a higher dividend can be expected at this stage. Paint shares tended to come in for more attention with Pinchin Johnson 53s. 9d., and Goodlass Wall 35s. yields now being attractive at current levels and the market is assuming that the future holds prospects of higher dividends. Many paint companies will benefit substantially from the abolition of E.P.T. and trading profits are likely to be maintained. Sangers were steady at 35s. 3d., with Griffiths Hughes 46s. 10½d. Beechams deferred 22s. 6d., and Boots Drug 57s.

Oil shares have been active but fluctuated rather sharply and were lower on balance, sentiment failing to benefit from the news that the Petroleum Board is to be dissolved at the end of the year, which, however, it is officially stated will not mean the end of petrol rationing. Anglo-Iranian eased to £9⅛ partly owing to reports of further Russian moves in Persia. Shell were 96s. 3d., and C. C. Wakefield eased to 71s. 10½d.

British Chemical Prices

Market Reports

THERE has not been much outstanding interest in the industrial chemicals market during the past week. The price position is unchanged and firm and there has been no evidence of any improvement in supplies. A little more activity has been reported from several sections and the flow of inquiry for new business is on an increasing scale. There have been no changes either of market conditions or prices in the coal-tar products section.

MANCHESTER.—Extremely firm price conditions are reported in virtually all sections of the Manchester market for light and heavy chemical products, and the tendency is for higher rather than lower rates so far as future movements are concerned. In some of the leading heavies, including soda ash and other alkalis, supplies are very tight and smaller allocations continue to be made to consumers. Deliveries under contracts are going forward steadily and additional home and export business covering a fairly wide range of products has been reported during the past week. On the whole, the fertiliser market has been slightly more active, while steady pressure of supplies of the leading tar products is a prominent feature.

GLASGOW.—In the Scottish chemical market no great changes can be reported apart from the return of the supply position of soda ash from very bad to the not quite so bad position of a few weeks ago. In the export market inquiries have been particularly numerous especially for acids and calcium carbonate, but there has been a demand for the whole range of chemicals.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Preparation of silica containing catalysts.—American Cynamid Co. Sept. 22, 1942. 16501/47.

Organo-siloxanes and methods of making them.—Corning Glass Works. Feb. 26, 1942. 3638/44.

Process of preparing a copolymer of vinylidene chloride.—Dow Chemical Co. June 2, 1939. 16077/47.

Insecticidal composition.—Dow Chemical Co. May 1, 1942. 16328/47.

Nitrogen and sulphur containing beta-substituted carboxylic acids and method of making same.—B. F Goodrich Co. Oct. 5, 1945. 26441/46.

Preparation of beta-acyloxy carboxylic acid compounds.—B. F. Goodrich Co. Oct. 5, 1945. 26442/46.

Insecticides.—Merck & Co., Inc. Sept. 14, 1945. 24996/46.

Method for removing weakly acidic substances from substantially neutral organic water-immiscible liquid.—Pure Oil Co. June 22, 1940. 16241/47.

Preparation of guanidine salts.—Honorary Advisory Council for Scientific and Industrial Research. Oct. 25, 1944. 11981/45.

Chemical process.—Standard Oil Development Co. Feb. 12, 1942. 16609/47.

Methods of forming complexes of basic silver compounds, and the compounds resulting therefrom.—Sunshine Mining Co. Feb. 20, 1945. 11990/46.

Preparation of synthesis catalysts for the synthesis of hydrocarbons.—Texaco Development Corporation. Jan. 4, 1946. 38010/46.

Bromine-containing olefinic compounds.—United States Rubber Co. Jan. 3, 1946. 35422/46.

Production of aluminium.—Aluminium Laboratories, Ltd. January 31, 1946. 136/1947.

Method and apparatus for vulcanising a strip of uncured rubber.—American Hard Rubber Co. February 6, 1941. 18130/1947.

Preparation of organoboron compounds.—British Thomson-Houston Co., Ltd. October 25, 1945. 31753/1946.

Diazo-dyestuffs.—Ciba, Ltd. January 31, 1946. 2132-33/1947.

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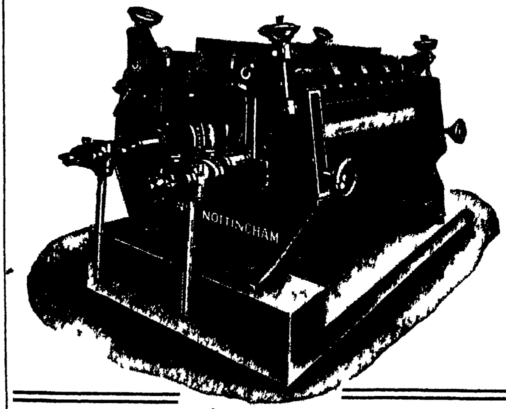

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A Mighty Plan

THE Government has been loudly acclaimed as one composed exclusively and essentially of planners. It would naturally be expected that they would meet the undoubted emergency that existed when they took office—an emergency that grows more urgent with every day that passes—with a comprehensive and clear-cut plan. It is essential, moreover, that any plan that may exist should be explained to those who must put it into effect. The simplest form of plan is that which says to industry: "This and this is the position; we want exports, get on with the job and come to us for any help you may need." That is perhaps hardly a plan, it is the organisation of industry to meet the threat of national bankruptcy. It would pre-suppose that industry should be allowed a reasonable profit on its undertakings and given a free hand to do whatever is needed to achieve the objective. That was not the "plan" that the Government adopted.

The plan, if it can be called such, appears to be the direct antithesis of that one. It said in effect: "This and this is the position; we shall control every movement you make; we shall tell you what to do; we shall tell everyone in the country what to do; do nothing unless we tell you to do it; and if you make any profits we shall take them." To put such a "plan" into effect requires a totalitarian state; and this we have not yet achieved. But it may come later. It certainly requires some very experienced business man at the head of every Government department and a Cabinet composed of those with vast experience in industrial affairs. Since that is singularly lacking, the result is that so far as we can discern there is no "plan." There is concentration on the nationalisation of certain basic industries. There is a general insistence that we must tighten our belts till it hurts and export everything that we need for ourselves. But is that a "plan"? What we see (with apologies to Pope) is "a mighty maze, but quite without a plan."

Our present difficulties are essentially economic. They are caused through loss of our overseas investments during and between the two German wars so that those invisible exports upon which we relied so largely to keep our Budget straight have disappeared into thin air in a modern rake's progress that was none of our choosing. The simple problem, the "this and this" which we have quoted earlier in this discussion, is to recover our financial stability in a world confused and rendered poor by the destruction of war. That is a problem for bankers, economists, and above all for sound "hard-headed" business men. Since the solution of the problem depends wholly on industry, industry should either have been told clearly what policy to adopt, or left to work out a policy for itself and for the nation in collaboration with the Government. But we read in a recent issue of the National Union of Manufacturers' Journal: "If orderly progress towards the economic recovery of Britain is to be made, there must now be reached a clear understanding as to the place which the private sector is to occupy in our industrial life and the conditions under which it is to be allowed to carry out its very heavy responsibilities. The National Union is inundated with requests for enlightenment and guidance in the bewilderment and frustration which surrounds most of those who endeavour to respond to the Government's exhortation to produce

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more goods from the limited available supplies of labour, raw materials and fuel. . . . The present outlook is a fog of doubt and uncertainty. . . . How, in such a welter of uncertainty, is the manufacturer to quote firm prices and delivery dates?"

There are important signs that we are already reaching the end of the sellers' market. The N.U.M. journal records that the sellers' market is already so far reduced that such important matters as ability to quote firm prices and delivery dates are coming into operation as important factors in obtaining export business. Other nations are able to make these promises under penalty; British manufacturers in general are not. Some foreign buyers are accepting a clause which states that the British manufacturer is only under penalty if the delay is under circumstances which are not within his control. Other foreign buyers, however, are already insisting on definitive dates and fixed prices under penalty—and our North American competitors are agreeing to these terms. Control, which should have enabled us to do all these things, has only succeeded in making uncertainty still more uncertain.

Some of the industries of this country are very large. There are a few firms of the size and calibre of Imperial Chemical Industries. There are the great steel firms, the Central Electricity Board, the railways, great gas undertakings and so forth. But too often the Government appears to legislate only for these very large undertakings. Some two-thirds of British industry, however, is composed of small firms and this applies to the chemical industry as much as to any other. The small firm, no less than the large undertaking, exists for the purpose of making profits, but all British firms of standing accept the principle that the first duty of industry is a service to the community and that industrial concerns exist only by virtue of their ability to give this service. Under the present system of Government control from the centre there are approximately two million Civil Servants, *i.e.*, 10 per cent of the working population is non-productive. It has been computed that on a full count of State servants—the armed Forces, police, fire service and professional people—each twenty people otherwise employed must carry two Service members, half a munition worker, and four Civil Servants; *i.e.*, each three producers must carry one non-producer, an arrangement which obviously increases taxation considerably and therefore increases cost.

There can be no question but that there must be reached immediately a clear understanding of the function of privately-operated enterprise and of the facilities which will be afforded to enable it to operate efficiently. The N.U.M. has no doubt as to how industry can be enabled to play the part which it is necessary that it should play if the economic stability of the nation is not to collapse. Here, in the words of the N.U.M. Journal is the answer: " A stop should be put to the persecution of private enterprise; encouragement should be given to initiative, energy and good management, industry should be consulted before plans are made and principles irrevocably decided; full information should be given regarding the future operation of nationalised services which will provide a complete stranglehold on the private sector and the incidence of taxation should be changed to give encouragement to efforts made to help the country to recover its economic health."

NOTES AND COMMENTS

Depressing Figures

THE figures of coal won from the ground in July cannot be called exactly encouraging. With 20,000 more workers on the books than in July last year, there was each week an average of 160,000 tons less. It is true that much of this loss can be attributed to recognised holidays—and for that reason alone we fear there will be an even worse showing for August, the traditional holiday month. Apart from the question of holidays, there must be internal evils in the coal-mining industry which are holding back coal production. One of these evils is the practice of still having private enterprise carrying on within a nationalised industry. Normally we are fervant upholders of private enterprise. But this particular bit of private enterprise is something which has been long condemned both by owners and some miners themselves, although we fear strikes if there is any attempt to stop this practice. What we have in mind is the system of contracting, whereby instead of a man working for a specified wage (or rate) in a given capacity, he accepts contracts. These contracts, say to produce so many tons of coal, remove so much rock, lay so many yards of road (rails) or to repair machinery, provide for the payment of an agreed sum for the work. They permit the contractor to engage the services of fellow workers (the management concurring, of course). The workers engaged on these contracts are paid by the contractor a fixed sum to do fixed work. Whether they take six or eight hours over the job, the amount is fixed beforehand. Obviously experienced men will not accept a job which will not repay them well. Usually they finish the job with time in hand and are then able to walk out of the pit. Other workers, seeing them finish work and thinking they may have earned more by fewer hours of work, become dissatisfied with their own hours and wages.

The Contract System

ARGUMENTS in favour of this contract system are that there is some incentive given to the workers in that they can earn more money by working harder. They can finish their jobs, too, in quicker time if they " go to it " and can then down tools and go home. They are not tied to the pit for a certain number of hours. These workers usually have more leisure time than those not working on these contracts. Against this must be set the dissatisfaction felt among non-contract workers. There is further the waste of time spent in haggling over the amount to be paid and the work to be done for each contract. This may seem a small item, but hours literally are wasted in some pits over this haggling. A last point is that some contractors are not as impartial as colliery officials should be, and allot the better jobs to their pet cronies to the disgust and dissatisfaction of men who are given the more arduous or less remunerative work. This contract system is recognised by the unions: there are minimum wage levels for men working for contractors. If the Coal Board tries to get rid of this system they will have a series of strikes on their hands. But, we think, it is not the best system for harmonious working nor does it get sufficient coal. Even if the coal mining industry reaches the target of 200,000,000 tons this year, the chemical industry, according to the estimates of Imperial Chemical Industries, will be able to work only to 85 per cent of their full capacity. To help get as much coal as possible, all restrictive practices—and the contract system must count as such—should come to an end. By this means the target may be exceeded and the chemical and other industries be able to go full out for exports.

Quotas Not Met

HOW does the present reduced output affect the chemical industry? In the first place it seems that fuel quotas—much reduced from the normal pre-crisis quotas—are not being met. In these circumstances it is proving an almost impossible job for some firms to put aside enough coal for a three weeks' supply for the winter, which is what Mr. Shinwell demands. If it is absolutely necessary for firms to have this reserve of coal, then the least that the Fuel Ministry can do is to keep to the fuel quota which was worked out, we presume, in the knowledge of all the present and future factors. In this connection we wonder, incidentally, why Mr. Shinwell is so insistent on this reserve being built up. Is there going to be a coal-less three weeks some time during the winter, or is he afraid that transport, which showed the severe strain last winter, may collapse altogether during this coming cold weather? However, despite the Government's failure to maintain the fuel quota, some firms in the N.W. are well on the way to building up their coal reserves. Many have done this by their foresight in changing partially from coal-burning to oil-burning. We hope that in September, with holidays out of the way, more coal will be forthcoming and the chemical industry will be able more easily to provide reserves of fuel for the winter.

More Headaches

BUT, urgent though this coal problem is, it is not the only headache for the chemical industry at the moment. The problem of staggering hours so as to reduce peak-loads of electricity, and even electricity-less days has to be faced. Many chemical processes are continuous and the working hours of their staffs are already staggered. It may be that some processes, *e.g.*, drying, may at present be concentrated into certain hours of the day, and could, perhaps, be moved over to periods when there was less demand from others for electricity. But where a chemical manufacturer is surrounded by firms in other industries, it will not be as easy for him as for them to say if and when he should have a day without electric current. The district committees which are working out which days the districts shall be cut off must bear in mind that many chemical manufacturers cannot face with equanimity the prospect of having power cut off for a day each week. Makers of other goods could just stand off their men, but the chemical manufacturer in many cases will stand to lose money and materials. Because of this, some firms have provided themselves with generating plant. Two firms whose chairmen have recently announced their purchase of oil-burning generating plant are Catalin, Ltd., and Dufay-Chromex, Ltd. But as the Government has now put a ban on the conversion of coal-burning to oil-burning plant, we presume oil-burning generating plant, too, will come under this stoppage, and no more firms will be able to make themselves independent of electricity cuts.

Better Figures

CHEMICAL trading statistics for July, details of which are given elsewhere, show a marked increase in the value of chemicals exported during the month. From the June figure of £5,581,832, exports of chemicals, dyes, drugs and colours, rose to £7,170,454 during July (compared with a monthly average of £1,856,649 during 1938). For all chemicals, including oils, waxes, soap, etc., there was an increased export value of £1,480,736. On the other side there was a slight increase in the value of imported chemicals from £2,329,278 in June to £2,447,407 in July, but, including oil, waxes, soap, etc., there was a bigger increase—from £9,046,252 to £10,983,132. Among chemicals, of which the import increased considerably is carbon black (75,260 cwt. in July against 42,486 cwt. in June), potassium compounds (798,474 cwt. in July, 704,159 cwt. in June), essential oils (541,415 lb. in July, 293,202 lb. in June), and paraffin wax (46,455 cwt. in July, 21,927 cwt. in June). Against these were increased exports of ammonium sulphate (38,553 tons : 17,108 tons), cresylic acid (240,333 gal. : 188,118 gal.), tar oil and other heavy coal-tar oils (9,302,061 gal. : 3,300,276 gal.), sulphate of copper (4583 tons : 2555 tons), caustic soda (178,519 cwt. : 99,443 cwt.), and sodium carbonate including soda ash (233,935 cwt. : 185,713 cwt.).

Chemical Chiefs on Trial

THE trial opened at Nuremburg this week of 27 former directors and high-ranking officials of the German I.G. Farbenindustrie trust. The court is presided over by four American judges and among the party of experts summoned from this country is Lord Wright, chairman of the United Nations War Crimes Commission. The indictment, running to 72 printed pages, alleges that the accused "committed crimes against peace, war crimes, and crimes against humanity, and participated in a common plan or conspiracy to commit the said crimes." The chiefs of the accused, Buettefisch and Gattineau, are alleged to have contacted Hitler in 1932 and secured Nazi party support for their plans for synthetic petrol production and to have developed secret armament works in 1933.

It is also alleged that Farben had cartel arrangements, sales agreements and other associations with hundreds of foreign firms, including the Standard Oil Co., New Jersey, and the American Dow Chemical Co.

U.K. Chemical Trading in July

Export and Import Figures

STATISTICS contained in the Trade and Navigation Accounts of the U.K. for July continue to show many marked differences compared with the same period last year and with June this year.

Among imports, acids rose fairly sharply compared with June, boric and tartaric even exceeding the monthly average for 1938. Calcium carbide, however, dropped heavily compared with June and was but a fraction of the average 1938 figure. Under potassium compounds considerably less caustic and lyes arrived in this country, though potassium chloride supplies showed a marked increase, while nitrate imports ceased altogether. Ethyl alcohol, of which none was imported in July, 1946, arrived to the tune of 1½ million proof gallons. An interesting feature of synthetic dyestuff supplies is that they are now being received in appreciable quantities from Germany (more, in fact, than from all other foreign sources combined), whereas a year ago, when Switzerland was the main supplier, Germany sent us none at all. Lithopone, of which none is being imported, in 1938 arrived at a monthly average rate of 24,875 cwt.

On the export side of the balance sheet, ammonium compounds have continued to be exported at a greater monthly rate than in 1938, the figures for July being substantially larger than those for June, though much less than those for July, 1946. On a smaller scale—and with less marked differences between the respective figures—the same can be said of calcium carbide.

Tar oil exports, which had been maintained at a level roughly corresponding to those of 1938, suddenly soared last month to over 9 million gallons, *i.e.*, more than three times the average monthly figure for 1938, the June (1947) figure being rather less than 3 million gallons. Disinfectants, insecticides, etc., exported during July amounted to more than double the average monthly total for 1938, though they were reduced in quantity by nearly 25 per cent compared with July, 1946. The June (1947) figure shows that the July total is a step in the direction of reaching the rather higher 1946 figures. Salt exports, despite of a good June figure, dropped last month to 11,846 tons, which is not much more than half the average amount sent abroad in 1938. The totals for sodium carbonate and caustic soda, though considerably less than those of July, 1946, show an advance on the June (1947) figures. Quinine and quinine salts exports during July were almost exactly double the monthly average for 1938. Finished coal tar dyestuffs continued greatly to exceed 1938 figures.

CHEMICAL EXPORTS

	July, 1947	July, 1946.
	Cwt.	Cwt
Citric acid	316	2,089
Formic acid	1,749	1,662
Tartaric acid	579	602
	Tons	Tons
Aluminium oxide	437	38
Sulphate of alumina	2,348	2,234
All other kinds	345	510
Ammonium compounds	38,553	50,448
Nitrate	709	11,075
	Cwt.	Cwt.
Bleaching powder	46,374	95,323
Calcium carbide	2,616	23,084
	Gal.	Gal.
Benzol	6,853	40,538
Cresylic acid	240,333	272,628
Tar oils	9,302,061	298,650
	Tons	Tons
Copper sulphate	4,583	4,819
	Cwt.	Cwt.
Disinfectants, etc.	63,986	83,313
Glycerine	1,401	8,429
Lead acetate, litharge, red lead, etc.	3,039	3,119
	Gal.	Gal.
Tetraethyl lead	106,171	—
	Cwt.	Cwt.
Nickel salts	8,686	4,893
Potassium compounds	7,830	12,432
	Tons	Tons
Salt	11,846	16,245
	Cwt.	Cwt.
Sodium carbonate	233,935	452,552
Caustic soda	178,519	285,112
Chromate and bichromate ...	81	5,157
Synthetic nitrate	21	10,599
Silicate (waterglass)	9,114	17,277
	Oz.	Oz.
Quinine and its salts	262,106	173,194
	Mega Units	Mega Units
Penicillin	3.004	2,801
	Cwt.	Cwt.
Coal-tar dyestuffs	18,397	16,917
Extracts for tanning	13,930	15,928
Earth colours	19,106	20,999
Lithopone	10,088	12,732
White lead	594	1,665
Soap (excluding toilet, shaving and abrasive)	23,898	18,358
Paraffin wax	6,080	7
	£	£
Total* value of chemical manufactures	7,921,105	7,246,024

CHEMICAL IMPORTS

	July, 1947	July, 1946
	Cwt.	Cwt.
Acetic acid	7,992	1,696
Boric acid	6,400	1,660
Tartaric acid	4,000	1,200
All other kinds of acid	3,261	103
	Tons	Tons
Ammonium phosphate	3,300	2,700
	Cwt.	Cwt.
Borax	14,800	9,740
Calcium carbide	1,670	1,964
Glycerine	156	24
	Lb.	Lb.
Iodine	59,669	59,571
	Cwt.	Cwt.
Caustic and lyes	744	6,021
Potassium chloride	798,474	198,398
Potassium nitrate	—	1,975
Potassium sulphate	30,480	1,640
All other potassium compounds ...	1,276	1,276
Sodium nitrate	19,940	72,381
	Pf. Gal.	Pf. Gal.
Ethyl alcohol	1,584,400	—
	Oz.	Oz.

(*Continued overleaf*)

Allocations of Tin Metal

THE Ministry of Supply announces that the Combined Tin Committee has made a further interim allocation of tin metal for the second half of 1947 amounting to 15,710 tons. This allocation is in addition to a first interim allocation of 11,331 announced on July 8 (THE CHEMICAL AGE, July 12, 1947). Together these total 27,041 tons and represent nearly all the tin that can be expected to be available during the remainder of 1947. Although the committee may be able to allocate small additional quantities later in the year, it must be understood that the present allocations will have to cover to a substantial degree the needs of the consumer-countries for this period. The allocations to individual countries are shown below.

	Interim Allocation	New Allocation	Total Allocation to Date
		(long tons)	
Australia	103	172	275
Austria	22	75	97
Canada	300	700	1000
Czechoslovakia	161	347	508
Denmark	119	46	165
Finland	35	15	50
France	1515	2600	4115
Hungary	—	203	203
India	525	2738	3263
New Zealand	42	125	167
Norway	90	51	141
Poland	239	2	241
Sweden	293	200	493
Switzerland	225	297	522
Turkey	90	96	186
United States	6750	7907	14657
Uruguay	25	16	41
Others	797(a)	120(b)	917
	11331	15710	27041

(a) To countries not receiving an interim allocation on August 21st.
(b) For small allotments to miscellaneous Latin American and Middle East countries which do not submit requirements directly to the Committee.

The committee wishes to emphasise once more that tin metal supplies available are sufficient to meet only a little more than half the requirements of importing countries for consumption during the period. Although tin production is increasing, normal supply conditions are not expected to prevail for some time to come. It has not been possible to make new allocations to certain countries at this time either because satisfactory statistical information has not yet been presented to the committee or because purchases in excess of previous allocations have off-set the quantities to which they would otherwise have been entitled.

Supplies may be obtained from the following sources: The United Kingdom, on behalf of Malaya and Hong Kong, the Netherlands, Belgium, China, Siam and the United States, for stocks of Japanese tin. In addition, small demands of certain Latin American and Middle Eastern countries may be met from British, Belgian, Dutch and United States sources. September 30, 1947, is the latest date for applications to buy Japanese stocks.

Detailed information as regards procurement may be obtained from the Secretaries of the Combined Tin Committee or from the Directorate of Non-Ferrous Metals, 20 Albert Street, Rugby.

(*Continued from page* 285)

Quinine and its salts	371,197	17,652
	Lb.	Lb.
Menthol	16,425	7,183
	Cwt.	Cwt.
Synthetic organic dyestuffs ...	1,810	262
Carbon blacks	75,260	63,198
Lithopone	—	—
	Lb.	Lb.
Essential oils	541,415	564,265
	Cwt.	Cwt.
Turpentine	4,126	5,880
Paraffin wax	46,455	56,790
	£	£
Total* value of chemical imports	10,983,132	8,234,520

* *including some commodities not listed here.*

German Cellulose Wool Products.—Yeast and cellulose wool are being produced by the Kurmärkische Zellwolle and Zellulose A.G., Wittenberge, which is now owned by the State. The firm has recently taken up the manufacture of albumen, carbon disulphide and cottonwool. A new plant at present under construction is intended to produce 1000 kg. of cellulose wool a day. At present 1800 people are employed.

R.I.C. Examination

An examination for the Associateship of the Royal Institute of Chemistry of Great Britain and Ireland is to be held in London during the week commencing Monday, January 19, 1948. Candidates not yet accepted should obtain a form of application from the Registrar without delay, so as to leave ample time to secure thereon the necessary signatures certifying that they have complied with the Regulations concerning their courses of training. The completed application forms must reach the Institute not later than Monday, October 13. No application in respect of the January examination will be considered if received later than that date.

Entry forms will be sent as soon as they are ready to all candidates who have been previously accepted and to those whose applications have been received as above. The last date for the receipt of entry forms will be Monday, November 17, after which no entry can be accepted.

International Progress in Plastics

Developments Reported at the XIth International Congress

SINCE the last Congress held in Rome in 1930, work in the plastics field has shown steady progress and achievements. This work, which went on in the various countries during the war, attained a considerable measure of success in spite of the many difficulties. Many of the papers presented at the International Congress showed the progress in this field. Among the papers presented in Section 11 (Chemistry in Relation to Elastomers, Plastics, Glass and Ceramics) the following abstracts may be quoted:

Plastics Progress, 1939-1940

By N. N. T. SAMARAS and R. J. SCHATZ

(Plastics Division, Monsanto Chemical Co., Springfield, Mass, U.S.A.).

Although by 1939 the United States of America had achieved world plastics leadership, producing 250 million lb. of intermediates valued at 50 million dollars, the real growth occurred during the next seven years. Production increased 500 per cent in this period—a phenomenal expansion exceeded only by that of synthetic rubber and magnesium.

A dozen plastics materials grew from pilot plant experimentation to large scale production. Polyvinyls, of negligible volume in 1939, were exceeded in tonnage in 1946 only by alkyds and phenolics, and on a dollar basis were virtually equal. Polystyrene, spurred when the monomer became available *via* the synthetic rubber programme, ranked sixth by 1946 and may be second by 1949. Nine new polymers arrived on the commercial scene—silicores, polytetrafluorethylene, and melamines being among the most notable chemically. Innumerable new end-uses have appeared. Paper and textile treatment, adhesives, wire-coating and other miscellaneous applications to-day consume greater tonnage than moulding.

Chief factors in plastics progress are: (1) the youth of the industry; (2) wide range of properties; (3) war-time acceleration; (4) vigorous research; (5) concurrent development of fabricating machinery; (6) standardisation of tests; (7) bonding with wood, paper, cloth, glass, etc.; (8) price reduction; (9) relative abundance of raw materials; (10) profit-making ability. A prediction of continued growth is based on: (1) development of copolymers and blends; (2) mechanical alteration—*i.e.*, orientation and stretching; (3) innovations in mass production techniques; (4) greater supplies of phenol, phthalic anhydride and plasticisers; and (5) pioneering research in silicon, sulphur, phosphorus and nitrogen types.

The Possibility of Hydroxyl Reaction in Phenolic Resin Formation

By DR. C. A. REDFARN

A brief résumé was given of the early theories of Baekeland and others on the structure of hardened one stage phenol-formaldehyde resins (resites), indicating how the early structural theories postulated reaction of the phenolic hydroxyl groups to give either linkages: later investigators (Koebner, Megson, Weith) tended to the view that phenols are reactive towards formaldehyde only in the 0.0′ and *p* positions. This view, coupled with the Functionality Theory, predicts that phenol, *m*-cresol, 1 : 3 : 5-xvlene 01 and resorcinol give thermoset resins, and *o*-cresol, *p*-cresol, 1 : 2 : 5-xylenol, 1 : 3 :4-xylenol and 1 : 2 : 3-xylenol give permanently thermoplastic resins.

The author reported the production of thermoset resins from *o*-cresol, *p*-cresol, *p*-seloroxylenol and hemimellitenol, and tentatively a thermoplastic resin from prehnitenol.

From this and the reported failure of diagomethane to methylate resite, it is suggested that in some unspecified manner the phenolic hydroxyl group enters into the cross-linking reaction in resite formation.

The Crystallisation of High Polymers and Its Effect on Their Mechanical Properties

By GEOFFREY GEE

Polymers differ from substances of low molecular weight in that they are never wholly crystalline. Crystallisation of a polymer consists in the fitting together into a regular lattice of portions of adjacent molecules, leaving inevitably some regions, which are unable to achieve the necessary order. The ratio of crystalline to amorphous in a polymer is thus likely to depend not only on the external conditions but also on the history of the particular specimen considered. The concept of an equilibrium between two phases is therefore of very limited value. The thermo-dynamic description of the system is discussed, and a physical interpretation given of the melting range of a polymer and its dependence on the conditions of crystallisation.

It is now widely accepted that the tensile strength of an elastic polymer is closely related to its ability to crystallise. The hypothesis is advanced that the tensile strengths of a series of chemically similar polymers are determined by the extent to which they crystallise before breaking. Experimental data are recorded for a series of vulcanised natural rubbers. Systematic variations were made in the degree of cross linking, using several types of compound. The effect of swelling samples to varying extents in mineral oil was also studied. No quantitative estimate has been made of the extents of crystallisation obtained, but the results are in complete qualitative agreement with the hypothesis.

Plasticiser Action and Chemical Constitution

By D. Faulkner

The investigation had as its object the determination of the influence of plasticiser constitution on the plasticisation of polyvinyl chloride; this embraced the study of several methods of assessing plasticiser efficiency, *viz.*, the use of intrinsic viscosity value as an expression of solvent power, determination of equilibrium swelling, determination of the precipitability of polymer solutions, and plots of the load-extension characteristics of plasticised compositions.

The plasticisers used comprised (1) esters of constant molecular weight derived from aliphatic dibasic acids; (2) esters of phthalic acid. With the first series, satisfactory qualitative correlation between the result given by the above methods was obtained, a maximum in the values of solvent power being observed. Chain-branching in the plasticiser molecule reduced the solvent power. With the second series, correlation between the four methods was less satisfactory. The viscosity and swelling methods gave slightly different positions of maximum solvent power, while the mechanical tests could not be interpreted on the basis of solvent power alone.

The application of certain thermodynamic relations to the results obtained in swelling measurements is discussed.

Dissolving, Swelling and Plasticising of Polymers

By R. Houwink, Delft (Holland)

The difference between internal and external plasticising were discussed. Softening is considered to be a more adequate expression than plasticising, since it also covers the phenomena of elasticising. For external softening it is necessary that the softener enters into the polymer, leading to swelling.

The laws controlling the conditions for swelling are similar to those controlling the phenomena of dissolving and of permeation. The final result is dependent on the changes of free energy and thus on the magnitudes of the entropy increase possible, in relation with the changes in internal energy.

Two types of swelling are to be distinguished, namely, that of limited and that of unlimited swelling. The limited swelling observed in practice depends not only on the possibilities of interlinking, as is often found in literature, but also on the combinations of intermolecular forces involved.

For studying limited swelling, these quantities should be calculated per monomer group and not as an integral quantity for the material bulk.

New Chemical Plant

Catarole Process Scheme

MESSRS. Petrocarbon, Ltd., inform us that our Home News Item "New Oil Plant" is not quite accurate. They explain that the plant at Partington, Cheshire, is being constructed by Petrochemicals, Ltd., under the control of Petrocarbon, Ltd. It is not to be a new oil refinery, but a plant to operate the Catarole process for the production of chemicals from petroleum.

Partington Industrial Estates, Ltd. (a wholly-owned subsidiary of Petrochemicals, Ltd.), have acquired a freehold site of about 771 acres, of which approximately 120 acres are being used for the Catarole project. It is intended that the remainder of the land should provide space for the construction of plant and factories by users of the basic raw materials which Petrochemicals, Ltd., will be producing.

Construction was started in October, 1946, and, in spite of the fuel crisis and the restrictions in steel supply, it has been possible, by means of re-deployment of labour and alternative construction methods, to draw up a programme which corresponds to the original construction schedule. Ground preparation for the Catarole plant, in particular all underground work, has been completed and foundation work for the main units is in progress. Cooling water intake pipes and main drainage have been laid. Work on the main cooling water pumphouse is at an advanced stage. Electrical substations have been erected and transformers installed. The first permanent buildings are now being erected. The foundations for the main storage tanks have been laid and erection has begun. Three-quarters of the fuel oil, naphtha and gas lines have been welded up and laid. Production is expected to start in mid-1948.

Austria's Penicillin Output.—The Biochemie G.m.b.H., a firm controlled by a Austrian Brewery concern, is reported to have invested some 5 million schillings in the manufacture of penicillin, in which the company appears to have a monopoly. Plans are in hand to commence large-scale manufacture of penicillin, with equipment to be bought in France.

American Chemical Notebook

From Our New York Correspondent

DOW Chemical Company's fiftieth annual report to stockholders reveals that consolidated sales reached the record figure of $130,426,838 during the fiscal year ended May 31. This was 28 per cent above the sales attained during the previous year and approximately 4½ per cent above the wartime peak of $124,570,200 during the fiscal year 1944-45. The company's net earnings were equivalent to $9.22 per share on the 1,248,706 shares of common stock after deducting $1,215,476 paid in preferred stock dividends. In his letter to the stockholders, Dr. Willard H. Dow, president, stated that despite the fact that the year brought the first major strikes in the company's history, one at the Texas division and one in the government-owned styrene plant at Los Angeles, he now felt relations with the company's 14,000 employees to be "very good." He added optimistically that there appeared to be an "increasing appreciation of the fact that high productive effort is imperative to the payment of high wages."

* * *

In the first six months of 1947, shipments of finished steel totalled 31,172,157 tons, greater than any other peacetime shipments and were almost as large as shipments made during the entire year of 1939, according to the American Iron and Steel Institute. The more than 31 million total included 9,021,292 tons of hot and cold rolled sheet and strip steel, including galvanised, electrical and enamelling sheets, a record tonnage. This type of steel is formed into automobile bodies, baths, refrigerators and other products, and activity in these fields is still not great enough to meet all post-war needs. If production is permitted to continue uninterrupted for the remainder of the year, at the same rate as in the first half, the Institute predicts that the total output of sheet and strip steel should be at least 18 million tons, compared with 15,744,000 tons in the peak year 1941.

* * *

The Manufacturing Chemists' Association has issued Chemical Safety Data Sheet SD-14 on Trichlorethylene, the fourteenth in the series of chemical product safety manuals. The latest chemical safety manual may be obtained at a cost of 20 cents from the Association's offices at 608 Woodward Building, Washington 5, D.C.

* * *

One reaction to the recent banning of loading or unloading of ammonium nitrate at heavily populated ports in the United States is the strong possibility that the Puerto Rican Government may ask the United States Coastguard to reconsider its recently announced restrictions. Puerto Rico uses more than 80,000 tons of ammonium nitrate every year for the mixing of sugar cane fertiliser. Since the chemical is imported from the United States, the Coastguard will have either to revoke or modify its order (effective on August 9) otherwise the local sugar industry may be seriously affected.

* * *

Commenting on the recently announced ban on the acceptance of ammonium nitrate cargoes in the Port of New York, Fire Commissioner Frank J. Quayle states that the ban would be enforced" no matter what its mode of transportation—ship, rail, truck, plane or otherwise." It would apply to all quantities of the material, small or large. At Providence, Rhode Island, Mayor Dennis J. Roberts, acting in accordance with a request made by the United States Coastguard at Boston, has issued an order to his city's port and police officials banning vessels from loading, unloading or having aboard ammonium nitrate while in Providence Harbour. Taking the matter a step further, the Third Coastguard District, responsible to the federal government, and charged with the enforcement of safety regulations in the Port of New York and other ports from New Haven, Connecticut, to Edgemoor, Delaware, has issued an order classifying all nitrate-bearing ships to the status of explosive carriers. A ship's captain or line representative will be required to obtain a permit for the loading or unloading of ammonium nitrate in United States ports if the cargo exceeds 500 lb. Cargoes in excess of 500 lb. will have to be handled at remote points where the possibility of fire or explosion damage will be minimised. As a result, it would seem that the only likely points in the New York area suitable for the handling of ammonium nitrate cargoes are an anchorage in Gravesend Bay, about two miles off Coney Island, and the two-mile-long pier at the Earle Naval Ammunition Depot at Leonardo, New Jersey, which served as an ammunition depot during the war. Mr. Billings Wilson, director of operations for the Port of New York, has said that a safe distance from shore for the handling of ammonium nitrate cargoes ranging from 2000 to 3000 tons would be two to two-and-one-half miles. He emphasised, however, that if "no smoking" rules are enforced and precautions for handling the cargo are taken, ammonium nitrate is "no more dangerous than sugar."

A new glycol, 2-methyl-1,3, pentanediol, a dihydric alcohol, is being made available to industry in experimental quantities for evaluation by the Celanese Chemical Corporation. Possessing an unusual structure, the new glycol is expected ultimately to find wide use in soaps, detergents, softeners, and penetrants, in oils, hydraulic fluids, greases and lubricating oils, and as a plasticiser and coupling agent for resin solutions and printing inks. Containing one primary and one secondary hydroxy group, celanese methylpentanediol has been found to have unusual solubility for a wide variety of resins and is miscible with most common organic solvents. Its high boiling point, 215° C., plus limited solubility in water (10 parts glycol in 100 parts water) is said to give it a combination of properties not found in any other glycol now used in the above applications. In addition, the chemical reactivity of the hydroxy groups, makes possible the synthesis of various derivatives useful as plasticisers and also suggests the use of methyl-pentanediol as a modifying agent in the alkyd resin field.

* * *

The Third Naval District headquarters in New York has lately announced that the War Department is planning shipments of ammonium nitrate fertiliser to occupied areas of Japan and Germany from isolated naval bases. Loading of some shipments will be undertaken at the U.S. Navy magazine at Theodore, Alabama, and at the Earle Naval Ammunition Depot, under Navy supervision. Presidents of Leonardo, N.J., and the Leonardo Citizens' Association drew up petitions to prevent the landing of ships carrying nitrate at the naval pier. Captain Andrew G. Shepard, commanding officer at the Earle Naval Ammunition Depot, said that any loadings of ammonium nitrate would probably take place a mile or more from shore. One outcome of the present furore over ammonium nitrate was the announcement by a spokesman for the Cosmopolitan Shipping Company, operator of the *S.S. Molda* which was ordered out of New York harbour recently, that in future the company would probably refuse to accept ammonium nitrate cargoes. In official government circles in Washington it was feared that the labeling of ammonium nitrate as dangerous and explosive would endanger the Government's chances of disposing of its ordnance plants to private industry. This assumes that the cost of ammonium nitrate will be increased through higher insurance rates which are expected to come as a matter of course, as well as increased rates for freight, storage, and labour. It is almost certain that longshoremen will in future refuse to handle cargoes of the chemical for anything less than the $3.30 an hour, the rate usually paid for loading ammunition.

The high production levels maintained in the field of inorganic chemicals during May did not carry over into June, while the output of industrial chemicals in this field in June dropped slightly from the previous month, according to the Bureau of the Census of the U.S. Department of Commerce. A survey of 35 major inorganic chemicals disclosed that 24 were produced in lesser volume in June than in May. However, only seven were produced at a lower rate this June than during the same month a year ago.

Production of hydrochloric, nitric and sulphuric acids dropped to the lowest daily figure this year, although it was considerably greater than a year ago.

The output of phosphoric acid and the phosphatic compounds, with the exception of dibasic sodium phosphate, did not follow the downward trend of other groups of chemicals, being in fact the highest for any month on record. Dibasic sodium phosphate production declined slightly from the high May level but more than doubled the output for June, 1946. Only monobasic calcium phosphate was produced at a lower rate this June than last. Production of lead arsenate was the lowest for any June in recent years but a relatively high output of calcium arsenate was achieved. Carbon dioxide (dry ice) production rose to a record figure of 73,713,000 lb. in June, 1947, as compared with 73,574,000 lb. in May and 61,771,000 lb. in June, 1946.

The Department of Commerce has announced that the June production of normal superphosphate fertiliser fell off by 10 per cent from that of June of last year. The Bureau of Mines reports that aluminium output in May (51,116 short tons) was about 1 per cent above the average of the preceding five months and represented capacity operation of production plants for which power was available. The Bureau also reported that domestic production of bauxite established a post-war record in the first quarter of 1947, imports being almost double those of the preceding quarter. Imports, for which Surinam is the chief source, totalled 432,848 long tons, a gain of 83 per cent over the preceding quarter.

Polish Chemical Developments.—It is reported that the rebuilding of the superphosphate plant at Szczecin, Poland, is progressing. The sulphuric acid plant, forming part of the same works and now being rebuilt, is hoped to resume operations next Spring. An oxygen plant also being reconstructed in the same town is intended to go into production before the end of the year.

Chemical Comparisons by X-Ray Photometer

THE chemist's job of making chemical comparisons has been made easier, more economical and more rapid by the development of a new industrial instrument known as the X-ray photometer by means of which it is possible satisfactorily to determine such variables as the tetraethyl lead content of petrol, the concentration of an acid in water, the percentage of chlorination in a plastic, or the percentage of ash in coal. These determinations are reached by measuring and comparing the X-ray absorption of a sample and a reference, and although the utilisation of X-ray absorption for this purpose has long been known, the particular method employed in the X-ray photometer is an outcome of wartime experience.

When the United States Army Ordnance Department sought a rapid and reliable method of checking the explosive charge in hand grenade fuses to prevent premature detonation, engineers of the U.S. General Electric Company, asked to attack the problem, devised a method of X-ray testing which made it possible to check fuses at the rate of 4000 per hour. Working with this fuse-testing apparatus was only the beginning and further experiments followed. The company's General Engineering and Consulting Laboratory developed the X-ray photometer which consists of a source of X-rays, a fluorescent screen, multiplier phototube, an amplifier and an indicating instrument. The X-ray beam is interrupted by a synchronous motor-driven " chopper " in such a way that half of the beam passes alternately through each of two analyser cells, one containing the reference and the other the sample. In the half of the beam passing through the reference is placed an aluminium attenuator disc, the angular position of which corresponds with a particular thickness of metal.

X-ray photometer for speedy chemical comparison. An operator is shown placing samples in position preparatory to conducting a test

Alternate Screen Reception

The X-rays from the two halves of the beam are received alternately on the fluorescent screen, from which the fluorescence is transmitted to the multiplier phototube. The output of this tube passes through an amplifier to a peak comparator where it registers on a microammeter as a d-c signal indicative of the difference in intensities of the two halves of the beam. If the sample and the reference are identical the intensities of the two halves of the beam as received on the fluorescent screen are equal and the ammeter reading is zero without the use of the attenuator. If the sample and the reference are different it becomes necessary to introduce aluminium by means of the attenuator until the two halves of the beam become of equal intensity and the reading returns to zero. From the thickness of aluminium introduced into the reference half of the beam it is possible to determine empirically the proportion of certain elements in the sample as compared with the reference. In general, the method is most applicable where there is a considerable difference in the atomic numbers of the main substance and the particular ingredient to be measured.

In actual operation the X-ray photometer has been found to work satisfactorily up to a speed of six samples per hour. Under most circumstances the limiting factor has been found to be the time required for the preparation of the sample. Liquids, which must be measured as they are put into the analyser cell, require more time than solids when the latter are specimens of uniform thickness. Powdered solids such as coal, which must be weighed into the analyser cell, require more time than liquids. Preparation of the samples, however, can be arranged independently.

(*Continued on page* 301)

ISOTOPE DETECTION BY TRACER MICROGRAPHY

A NEW method for the more effective tracing of radioactive isotopes in materials in which they have been intentionally introduced has been developed by L. Marton, of the United States National Bureau of Standards, with the co-operation of P. H. Abelson, of the Department of Terrestrial Magnetism, Carnegie Institution of Washington. In this procedure, by means of a magnetic focusing arrangement, the radiation given off by a radio-isotope within a sample material is made to form an image of the emitting surface upon a photographic plate. The image may then be used in studying the distribution and concentration of the radioactive element present in the sample.

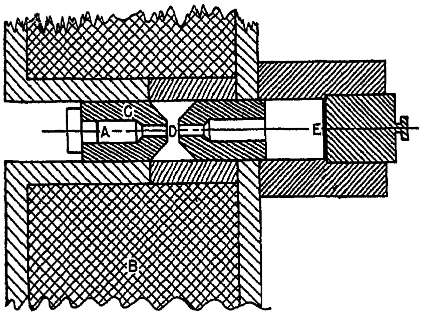

Fig. 1. Schematic diagram of the apparatus used for the location of radioactive tracer elements within a sample material by the new method of "tracer micrography." The surface of the disc at A is covered with a substance containing radioactive isotopes. The magnetic coil B causes the soft iron pole pieces C to produce an intense magnetic field at D. Electrons emitted in nuclear disintegrations of radio-isotopes within the sample are brought to a focus by this magnetic lens upon a photographic film at E

In many chemical, biological, biochemical, and other fields of research, there is growing application of the method of tracers, in which the isotope of a given element is used as an indicator to tag or label certain groups of atoms so that they may be distinguished from other atoms of the same kind. Identification of tracer elements is at present greatly facilitated through the use of radioactive isotopes, which, because of recent developments in atomic energy, are now available in large quantities and are relatively easy to detect through their radiations.

In order to improve the resolution of former tracer methods, it was decided to use electron optical image formation for determination of the distribution of a radioactive element within a given sample. This process, called "tracer micrography," is based on the emission of high speed electrons (beta rays) by many tracer elements and the use of magnetic lens elements for forming an image on a suitable recording surface.

In the absence of any means for correction of the chromatic aberration of electron optical lenses, the first micrographs were limited to those elements that emit electrons of uniform speed. After some attempts with columbium 93, yttrium 87, strontium 85, strontium 87, protactinium 233, and gallium 67, the last was selected for the initial tests. Gallium chloride prepared by chemical separation from zinc, was bombarded by heavy hydrogen nuclei in the cyclotron at the Carnegie Institution, and the solution was evaporated drop after drop on a ¼ in. tantalum disc. Radiation emitted from the surface of the disc, upon passing through a magnetic lens consisting of a small iron-clad coil with Armco iron pole pieces, was brought to a focus on a photographic film at a distance of about 3½ in. An image of the tantalum disc was

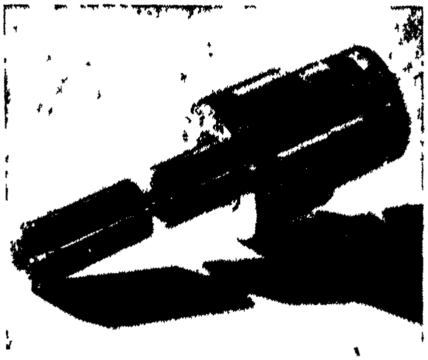

Fig. 2. Pole pieces of the magnetic lens A tantalum disc with a radioactive sample on its surface has been inserted at left. The larger-diameter portion at right is a simple film holder. When a strong magnetic coil is placed around the pole pieces, a magnetic field is produced, which focuses electrons emitted by radio-isotopes upon a photographic film. An image of the sample is thus obtained showing radioactive areas

thus obtained showing radioactive areas. The conditions were selected so that a linear magnification of 2 was produced.

For calibration of the instrument, the photographic film was replaced by a Geiger counter, and the lens current necessary to produce a maximum number of counts in unit time was determined for radiations of varying velocities. This established the focusing currents for a given type of radiation.

In preliminary experiments with samples of different concentration and thickness of the radioactive layer, exposure times ranged from two to twelve hours according to the age and concentration of the sample and the numerical aperture of the lens. It was found that micrographs with good definition were obtained consistently when the layer was sufficiently thin to avoid considerable self absorption. The best resolving power attained so far has been about 30 microns.

The simplicity of this method, both in apparatus and technique, is one of its more important features. Vacuum requirements are very moderate, since the mean free path of the electrons is large in comparison with the apparatus dimensions, even at forepump pressure.

Scientists at the (U.S.) National Bureau of Standards expect to obtain further improvements in tracer micrography through after-acceleration of the beta particles by means of a homogeneous electrostatic field. Such after-acceleration may well result in reduced exposure time and in better resolution due to a reduction in spherical aberration. A further reason for after-acceleration is that chromatic aberration which is always present, even in sources emitting particles of uniform speed, can be markedly decreased if the accelerating potential is at least comparable in magnitude with the energy of the primary emission.

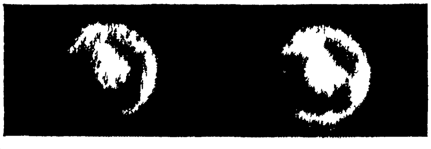

Fig. 3. Tracer micrographs showing the distribution of radioactive isotopes within a thin layer of sample material on the surface of a tantalum disc. These micrographs were obtained at the National Bureau of Standards by the electron optical method, in which a magnetic lens is used to focus electrons emitted by the radio-isotopes upon a photographic film. The resulting patterns are thus images of the surface of the disc showing radioactive areas. Improved resolution can be obtained by reduction in the size of aperture

INDIA'S CHEMICAL PLANS

INDIA can become self-sufficient with regard to fine chemicals, drugs and pharmaceuticals within a period of 15 years, according to the report submitted by the panel on the industry set up by the Government of India under the chairmanship of Col. R. N. Chopra. The panel feels that the proper development of the industry would depend very much on working out a well-balanced and integrated plan for the production of heavy chemicals, coal distillation products and organic solvents. Further, as the production of these materials is also necessary for the production of dyestuffs, artificial fibre, plastics, and synthetic rubber, a workable programme can be drawn up only by integrating the reports of the panels on these different industries.

Among the heavy chemicals, the manufacture of three items, *i.e.*, chloro-sulphonic acid, sodium and chloride of phosphorous, is very important and may be taken up without delay, while the production of intermediates from coal distillation products, such as aniline, acetanilide, chloro-benzene, phenoldiethyl aniline, para-anisidine, para-nitrotoluene, phthalic acid and anhydride, etc., deserves prompt attention.

Solvents

With regard to solvents, India produces ethyl alcohol in large quantities at competitive prices. Acetone, too, is being produced at one of the ordnance factories. Immediate arrangements should meanwhile be made for the manufacture of acetic acid, butyl and amyl alcohols and ethylene oxide. The manufacture of lactose for penicillin and thourea and guanidine nitrate for sulpha drugs is also recommended.

The most practical way to establish the fine chemicals and drugs industry in India, asserts the report, is to decide first upon the minimum number of drugs and fine chemicals essential for home consumption. Moreover, instead of the manufacture of essential drugs waiting for the production of basic chemicals, an early start should be made without them, utilising the raw materials already available in India until national resources are developed.

Shark Oil Industry

Pointing out the scope which exists for the expansion of the shark liver oil industry, the report recommends that a Central Board, representing the relevant departments of the Government of India, the Departments of Fisheries of the different maritime provinces and non-official experts, with a whole-time executive, should be formed to work out the necessary steps to put the shark liver oil industry on a firm and permanent basis.

U.S. POTASH INDUSTRY IN 1946

MORE new records were made in 1946 in the U.S. potash industry, both sales and production of marketable potassium salts reaching new high levels, reports the U.S. Bureau of Mines. Production in 1946 was 1,687,735 short tons of potassium salts containing 931,812 tons of equivalent potash (K_2O). This was an increase of 99,430 (57,569 tons of K_2O) tons of potassium salts over 1945. The production of marketable potassium salts in the United States has increased each year since 1934. Sales (1,673,249 tons) were 76,089 tons greater in 1946 than in 1945, and contained 928,374 tons K_2O. The value of the sales in 1946 was over 32 million dollars. The average value per ton of the potassium salts sold in 1946 was $19.23, slightly higher than that of 1945. Stocks of potassium salts in producers' hands at the end of 1946 were larger than in 1945. Exports of fertiliser potash materials continued to decline, whereas those for chemical uses were considerably larger. Imports of potash materials for fertiliser purposes increased in 1946, while those of chemical materials decreased. According to the American Potash Institute, domestic consumption of potash again made a new high record—actual sales for consumption reaching 862,532 tons.

Production of both grades of muriate of potash and of sulphate of potash and sulphate of potash-magnesia were larger in 1946 than in 1945. Production of manure salts (98,333 tons), however, even with the inclusion of spillage of higher grade salts, continued in 1946 the decline which began in 1944, and is now much less than half of the 1943 production of 242,189 short tons.

The dominant factor in the domestic potash industry is still the production from the Western States. California, New Mexico, and Utah furnished virtually all the 1946 output, the larger part coming from the deeply buried Permian saline sedimentary deposits of sylvite and langbeinite of the Carlsbad region of south-eastern New Mexico. The Eastern States supplied only a small quantity—from well brines in Michigan and as a by-product of cement operations.

Industrial Diamond Bulletin

The Industrial Diamond Information Bureau, Industrial Distributors (1946), Ltd., St. Andrew's House, 32-34 Holborn Viaduct, London, E.C1, publishes monthly a bulletin containing abstracts of articles dealing with properties and industrial applications of diamonds, - together with notices of patents and patent applications in many States. A copy of this bulletin may be obtained, free of charge, on application to the above address.

ENTERPRISE SCOTLAND EXHIBITION

ALTHOUGH the Enterprise Scotland 1947 Exhibition is a tacit admission of the importance of the chemical industries—as nearly every product relies at some stage on a chemical process or constituent—the industry, as such, has no separate section and only a limited representation. Designed essentially to show design in action and to feature merchandise of excellent design, the exhibition has concentrated rather on finished products than on Scottish industry as such.

One section of vital interest to chemical men is the Scientific Instrument Section. Here, from Kelvin, Bottomley & Baird, Ltd., are deadweight thickness testers, a galvanic sizing tester, a beating and freeness tester, a Sharman tubal insufflation apparatus, and an electrical barograph, among other items. Mu-Tron, of Edinburgh, a newly registered company, has a Universal analyser on show. W. B. Nicholson (Scientific Instruments), Ltd., of Glasgow,' show a lever balance designed for rapid weighing, while Peter Stevenson, Ltd., of Edinburgh, well known as manufacturers of chemical registration equipment, show gluemeters, wall thermometers, hydrometers, battery testers, saccharometers, hygrometers, angle thermometers, salinometers, specific gravity beads, scientific glassware of many types.

Apart from these displays, the exhibition as a whole stresses the debt of manufacturers to the industrial chemist, a point admitted by the designers at the outset. Entering the exhibition, the visitor faces a 10 ft. high, four-section glass panel screen, sand blasted, stone etched and acid finished to show figures 8 ft. high of James Watt, Henry Bell, Lord Kelvin, J. B. Neilson (technician in the blast furnace industry) and Robert Foulis, five Scots whose work in their respective spheres gave Scottish industry the impetus necessary in the past century. No better acknowledgment of the present debt of commerce to the technician and the chemist is necessary than the goods which are displayed in this show.

Cellulose Acetate Demands

Addressing the 10th ordinary meeting of Dufay-Chromex, Ltd., last week, Sir Herbert E. Morgan, presiding, said that cellulose acetate sheeting products are in great demand and preparations are in course which, subject to availability of raw materials and fuel, should allow them to double the output capacity as from December next. The company is making preparations to manufacture cellulose acetate containers by a new process.

SPANISH PAINT INDUSTRY

Manufacturers to Present Strong Case for Tariff Revision

PURSUING the policy of opening its columns to discussion of special problems affecting particular industries in the chemical field, the Spanish journal, *Revista Española de Quimica Aplicada* (ION) devotes several pages of its April-May issue to the troubles of the paint, varnish and allied industries. These will, no doubt, be further ventilated at the forthcoming third annual congress of the paint and allied industries, in Madrid in October next, at which will be announced results of a prize competition for the best essays on both the technical and economic aspects of those industries, including two firsts of 5000 pesetas each.

In the published discussion, leading manufacturers and others connected with the industry took part, among them: Señores Fernando Boronat (Director of the National Economic Section of the Vertical Syndicate of Chemical Industry), Rafael M. Badia, J. Echevarria (Machimbarrena y Moyua, S.A.), Fernanado Ruiz (Cia. Peninsular de Industrias, S.A.), A. O. Raurich (president of the forthcoming congress), S. Medina-Castellanos (Barnices Claessens y Romero Giron, S.A.E.), and Julio G. Mata (Graficolor Hartmann Hermanos, S.A.).

The chief subject of complaint among the manufacturers is the apparently anomalous and unfair incidence of import tariffs imposed to protect certain home industries, such as those supplying some of the essential raw materials needed in the paint and varnish trades, linseed oil, rosin (colophony) and turpentine, mineral pigments (chromes and zinc oxide), and fish oils.

Home Production Handicapped

Although import duties are also levied on manufactured paints, varnishes and printing inks, these can still be sold in the home market at lower prices than those of the Spanish manufacturers, owing to the high cost to the latter of raw materials. Thus, printing inks containing 50 per cent aniline dye pay 0.40 gold pesetas per kilo, while the same ink of home manufacture pays, on the basis of 50 per cent dye content, 3 gold pesetas per kilo. A similar case is that of nitrocellulose paint.

The adverse effects of this tariff policy are particularly marked in respect of linseed oil. Import is practically prohibited, and native seed supplies are strictly rationed at about 6 pes. per kilo, which is more than double the cost in the world markets. Yet Argentine linseed may be freely imported and costs only 1.80 pes./kilo delivered, as compared with 6-8 pes. for Spanish linseed, and 25-30 pes./kilo for the oil. Boronat says that the native product satisfies only about half the demand and, since foreign seed can be freely imported at a relatively low cost, it would seem that the other half of the demand should be met at a similarly low cost, if the Spanish oil-mills are fairly efficient and free to sell to the paint manufacturers. The native oil is of poor quality owing to the fact that the flax is grown chiefly for its fibre.

U.K. Supplies Needed

The position in regard to naval stores (turpentine and rosin) is not much better, although Spain is the third largest world producer of these products. White spirit, often used as a cheap substitute, is controlled in Spain by the Campsa and its price much higher than in the world markets. Much the same applies to other raw materials such as chromates and oxides and other pigment materials. The price of methylated spirit is very much above the average international level. Now that German supplies of dyes and pigments are no longer to be had, it is thought in some quarters that the English chemical industry could wholly or partly fill the gap.

Reference is also made to aluminium hydrate, glycerine, olein, and synthetic resins. Manufacture of the last has made some progress in Spain in recent years, but prices are still high: Albertol 16-30 pes./kilo; Novolac 40-50 pes./kilo; and Alkidal 60-70 pes./kilo. It is emphasised that these prices are much above those for English or Dutch products.

Apart from raw materials, other difficulties arise in obtaining much needed new and up-to-date plant—special reference being made to the improved and efficient type used in England—and in securing the requisite sheet metal for containers at a reasonable cost.

It is intended to press for revision of the duties still more insistently—earlier representations having produced no results—at the Congress in October, and meanwhile the Chemical Industry Syndicate, under Boronat, has prepared a strong case. The latter again urges that the two principal protective measures required are (1) to maintain present restrictions on imports of paints, etc., import licences being granted only in exceptional cases; and (2) to reduce duties on essential raw materials not produced or likely to be produced in Spain, while at the same time raising the tariff on certain other materials, intermediates, or finished products. The whole tariff policy should be governed by a fair and balanced view of Spanish chemical industry as a whole.

Scientists and Technicians from Germany

Modification of Scheme

As is well known, it was decided in December, 1945, as part of the general policy of securing industrial intelligence from Germany, to bring to the United Kingdom a limited number of scientists and technicians drawn from those fields in which German science and technique was most advanced. All proposals for the employment of Germans under this scheme had to be sponsored by a Government department and approved by an interdepartmental panel set up under the chairmanship of Sir Charles Darwin.

Hitherto, the scope of this scheme has been restricted to Germans who can make a scientfic or technical contribution to industry which cannot be made by a British subject, and the knowledge gained from their work has been made freely available to industry as a whole.

Within these strict limits a considerable amount of valuable knowledge has been secured and some progress has been made towards incorporating it in our industrial technique. Experience has, however, shown that if the exploitation of German scientific and technical knowledge is to be carried out to the fullest possible extent, some provision must be made to enable those Germans whose exceptional ability and usefulness have been proved to be retained on a more permanent basis by firms willing and able to translate German ideas into production. Authority should also be given for the entry into the U.K. of production engineers and technicians having the specialised knowledge and experience required for the rapid development of the underlying idea. Further, as the capacity of research associations to take Germans and provide specialised equipment has already been largely satisfied, and as in some fields no research association exists, it is necessary to rely increasingly on private firms to obtain the maximum benefit from German ideas and knowledge.

Accordingly, the scope of the Darwin scheme has now been modified. As previously, only Germans who have a significant technical contribution to make to British industry and who are required to fill positions for which no British subjects are available will be admitted. They will all be volunteers and brought over initially under Government contracts, and arrangements will be made wherever possible to give all potentially interested firms access to them. Subsequently, if the Darwin panel considers it desirable for the German to be retained after the initial period of six months and employed by a particular private firm, the German will be permitted to enter into a contract with the firm like any other alien entering the United Kingdom under a Ministry of Labour permit.

If the services of the best German scientists and technicians are to be obtained for this country it is important that applications for their services should be submitted *as soon as possible* to the production department concerned. In the majority of cases this will be the Raw Materials Department of the Board of Trade.

Other nations are anxious to obtain the services of these men and delay in approaching them may mean they will not be available for British interests.

International Plastics Training Agreement

An agreement has been reached between the British Institute of Plastics Technology, London, the Synthetic Materials Institute (Kunststoffeninstituut) T.N.O. of Delft, Holland, and the Technological Institute V.I.V. of Antwerp, Belgium, regarding the procurement of information and education on plastics. The British Institute is to arrange regular written courses for adult pupils in Dutch language and possibly also in French for Walloons. The instruction will be supported by lectures, exhibitions and films. The aim is to supply uniform information services and to foster investigation to the common advantage. The conflict on patent matters between Dutch plastic producers and Imperial Chemical Industries, Ltd., will not be allowed to interfere with these new arrangements.

As reparations from Germany, Holland has been awarded the Paraxol Works of Lippoldsberg for the manufacture of pentaeritrite. The equipment of this factory is reported to be of recent date, so that the Dutch capacity for making plastics will be tightened.

Output of mineral salt in Holland has now risen to much more than the pre-war level. The industrial activity of this branch, as well as the notable expansion of salt-derived chemistry, is now being concentrated at Hengelo. The former installations of Boekelo, which had suffered from Allied bombing during the war, are to be abandoned. The annual salt output runs to about 200,000 tons.

Chemicals in South Africa

From our Cape Town Correspondent

ACCORDING to figures released recently in South Africa, the Union imported chemicals, drugs, dyes and colours worth £607,400 from Britain during the first quarter of 1947, as compared with only £441,200 in the corresponding period of 1938.

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No move can be made to establish the first undertaking in South Africa's new £20,000,000 industry to produce oil and petrol from coal until the Minister of Economic Development returns from Europe, when appointments will be made to the Liquid Fuel and Oil Advisory Board. This board, for which provision is made in the Liquid Fuel and Oil Act, and to which the Governer-General gave his assent on June 4, will be the body to report on and recommend any applications for licences. The first application to be considered is one from the Anglo-Transvaal group, which has been investigating overseas processes and which has been planning to set up the industry for more than ten years. The Government is also investigating latest processes. The acting director of the Fuel Research Institute and the assistant industrial adviser to the Department of Commerce and Industries are examining plants in Britain and America and gathering information. Although no estimate of a total output can be made at present—the Liquid Fuel Board will lay down the scale on which operations will start—it will be greatly in excess of 10 million gallons a year. South Africa claims to have one of the richest coal deposits in the world and there is adequate cheap power available.

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Although DDT has apparently proved effective in killing off the tsetse flies in large areas of Zululand, it has not destroyed the entire insect life of that region. Following a recent test (nine dustings from the air with DDT smoke), a " light trap " was put out at night, and next morning it was found to contain more than 6000 insects of many kinds, thus allaying fears that spraying would disturb the balance of Nature.

* * *

A £1,000,000 company, the African-Italian Financial and Industrial Corporation, Ltd., has been formed to finance and undertake the transfer of a number of Italian concerns to South Africa. Among the factories is a £5,000,000 alcohol plant, which will be established in Natal and will, it is stated. have some connection with the Union Government's plans to manufacture oil and petrol from coal.

General Chemical Corporation, Ltd., is to erect a new factory on a 40-acre site in Johannesburg for the manufacture of a new range of products for the tanning and other industries. The firm's existing factories in Johannesburg and Durban make tanning oils, fat, liquors, pit disinfectants and anti-mould compounds. Developments overseas are being investigated and arrangements with British and American concerns are likely.

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The decision of a large Dutch concern, the United Leather Paint Factories of Holland, to buy a ten-acre site at Springs is a further indication of the growing popularity of the Reef in the eyes of industrialists. The firm is to build a factory and storage sheds, and a section of the plant is expected to be ready for operation by the end of the year. It is understood that production will at first be confined to the furniture lacquers. A large proportion of the necessary raw materials is available locally.

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The Consolidated Portland Cement Company is to establish a £1,000,000 industry near Port Shepstone, Natal, most of the capital having been raised in the Union. Some machinery has already arrived from Britain, and when operations start in about a year's time, production is expected to be geared to an output of 200,000 tons a year. Work on the 500-acre site has been started by the London engineering firm of Henry Pooley, Ltd., which has set up a branch in South Africa to undertake such contracts.

Another development in the cement industry comes from White's South African Portland Cement Co., Ltd., which is now building a new factory at Lichtenburg at a cost of £2,000,000. The firm's 34-year-old factory at White's, Orange Free State, together with the new one, will give a combined output of 10 million sacks of cement a year. It is also planned to expand the production of the company's special manufactures at Industria, Johannesburg.

Easier U.S. Alkali Position Foreseen.—According to the president of the Pennsylvania Salt Manufacturing Co.—one of the U.S. major alkali producers—the alkali position is becoming easier and production next year should suffice to meet all needs. Repairs and replacements at present being executed should increase the current output by about 10 per cent, while new plant construction should lead to a further 10 per cent increase.

Glass in the Laboratory—V

Cutting Glass Tubing

By I. C. P. SMITH, B.Sc., F.R.I.C.

THE study of the various methods of cutting glass tubing is essential to those taking up glass blowing, but it is almost equally valuable in the laboratory, and the cutting of a glass tube, bottle, or beaker need not be the hazardous undertaking which it frequently becomes. It is proposed therefore to review familiar and unfamiliar methods for both hand and machine operation, so that a choice may be made according to the circumstances. To the best of the writer's knowledge the method included under "Cutting Glass with a Hack-Saw" is described for the first time.

Glass Knives

The most familiar way of cutting glass tubing is first to produce a scratch or cut round the tubing, and then apply further means of converting this cut into a crack.

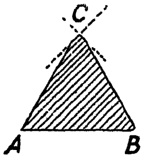


Fig. 1.

The usual glass knife, which is supplied with or without a handle, is made from carbon steel, hardened glass-hard by heating to bright redness and quenching in water. (Mercury is also advocated, if it is available.) A piece of hack-saw blade may be employed, but it should be heat-treated as indicated. The edge of the knife should be ground at an inclusive angle of 45°, preferably before hardening, and sharpened up if necessary afterwards. For sharpening during use a coarse-grain, hard-bonded carborundum stone is best, such as a scythe stone obtainable at most ironmongers. If an engineer's grinding wheel is employed, the knife should be given rapid strokes right along the blade to avoid overheating. A wetted wheel may be employed for this reason to advantage, but not one of the glass grinding wheels, as the owner of this wheel may object. The small "ampoule-knives" sometimes supplied with boxes of ampoules and manufactured by a stamping out process are frequently very good and the one that breaks easily is usually the best.

There are on the market glass knives made from non-ferrous tool-tip alloys and from tungsten carbide. Of these, the former are very good and particularly useful for cutting the hard glasses for which they should be reserved. They may be sharpened on a fine carborundum stone, preferably with the movement employed in sharpening a wood-working tool, in order to produce a fine straight edge. Knives made from tungsten carbide are a little too brittle and for this reason are inclined to lose their edge rapidly. Moreover, they require a diamond-embedded lapping wheel for re-sharpening.

Triangular files are cheap and readily available and form an excellent substitute for the glass knife if properly handled. The best form is a fine-cut file 4 in. or 5 in. long. Swiss jewellers' files are probably the best. When a file has lost its edge through use, it should not be discarded but should be re-sharpened by long strokes on the grinding wheel, giving the edge a blunter angle than the original 60°. In Fig. 1, A is an original angle, B as bluntened and C re-sharpened. It will usually be found to cut better than before.

The proper action of the knife in making a cut is a clean firm movement round the glass, not a sawing action in one place, and not a backwards and forwards movement about the section of a circle. The cut should be as truly as possible in a plane perpendicular to the axis of the tube. There are two techniques in holding the glass-knife: the one and possibly the simpler is to rest the glass on the edge of the bench and cut round the top as shown in Fig. 2; the other, to hold the knife under the glass with the glass held in the crook of the thumb, as shown in Fig. 3.

The single clean cut is important for two reasons, the one to obtain an incipient crack which is not a confused mass of little cracks, and the other to preserve the cutting edge of the knife. A second stroke with the knife in an already made cut has a bad wearing effect on its edge.

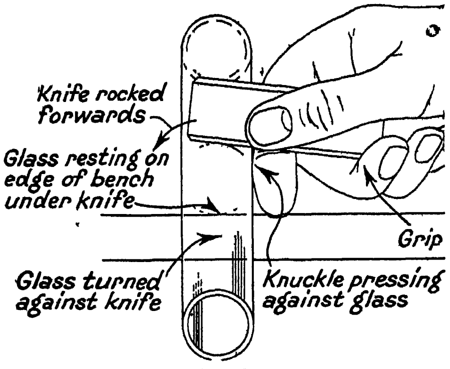

Knife rocked forwards
Glass resting on edge of bench under knife
Grip
Glass turned against knife
Knuckle pressing against glass

Fig. 2.

The next thing is the action of breaking the glass On small diameters the thumbs are placed together opposite the cut and a simple breaking action applied On larger diameters up to say, ¾ in , the action is one of pulling with a slight bending action the cut being of course, on the outside of the bend When one end is short it should be held in a duster Some glass blowers always wet a cut before breaking some wet the glass knife first and some do not believe either helps, and work dry The writer is convinced that wetting the cut does definitely make the glass easier to break, the action may be due to the capillary force of the moisture in the microfractures of the cut

When the cut is too near the end of the tube or for instance, on larger sizes when a breaking action is considered too risky, the little hot spot of glass is very useful First a rod of glass 2 or 3 mm dia is prepared and the end is heated to form a molten knob about 3 or 4 mm dia , this is placed on the cut with a slight initial stroking action in the line of the cut A crack usually starts immediately and is led round by movement of the hot knob in advance of the crack the knob being reheated if necessary

A more useful adjunct to the glass knife than the hot spot for cutting any size of tubing is the cutting jet It consists of a small gas jet giving a flame about ⅜ in to ½ in long, and it is important that this should be controlled by the smallness of the aperture of the jet and not by constricting the gas flow before the jet The difference is that the former makes a flame that is hot and firm while the latter causes a softer flame and one liable to bending in draughts of air A suitable jet is an Amal No 5 or a Bray type 441 No 0, in a metal tube holder, or it may be made from glass tubing preferably resistance tubing by taking a piece of 8 or 9 mm tubing with about 1 mm wall and constricting it in the middle maintaining a fairly uniform wall, until the bore is about ¼ to ½ mm It is then cut in the middle and the jet tried for size If it is too small, cut some off the end of the glass If it is too large heat the tip on the blow pipe flame carefully, watching the flame decrease The jet is attached to a length of light rubber tubing and used like a pencil

Fig. 3.

Soda Glass

Having obtained a good jet, it is trained tangentially on the surface of the tube along the knife cut, turning the tube back and forth so that the flame more than covers the knife cut On soda glass a crack usually starts quite quickly and easily On resistance glass it may be necessary to stroke the heated glass with a wetted finger along the line of the cut When the crack has started, it is followed round with the cutting jet

This technique may be employed on any size or thickness of tubing or bottles, beakers etc Bottles may need handling with some care but those should be selected which look good, of even wall thickness and free from bubbles, dirt, etc , as they are most likely to be free from strain and give a good crack If a strain viewer is available, examine the bottle first with this

Iron Hooks

These hooks are bent from ⅛ in to 3/16 in iron wire in the form of a semi circle, the remainder of the rod being bent in line with the diameter For cracking a tube already cut with the knife, a hook is chosen slightly larger in diameter internally than the glass, it is heated to redness and the tube carefully rotated in it in the line of the crack This usually works well, especially for soda glass in the large sizes It does not suit the resistance glasses Some workers prefer to run the knife-cut right round the tube

In cases when a maximum surety is required in unskilled hands, with such materials as are available in the laboratory, the use of strips of blotting paper or filter paper wrapped round the glass is advocated The paper is cut in long strips ½ in or ⅝ in wide, wetted and carefully wrapped round the glass, giving about four layers, 1/16 in either side of the knife-cut, leaving a channel about ⅛ in. wide about the cut. A small hot blow-pipe flame is then directed round the channel, at an angle to the glass and moving backwards and forwards an inch or two in either direction. On thick-walled tubing or a bottle this usually starts a crack quite neatly and it is then run round by stroking with the flame slightly in advance of the crack.

Stains in Joins

If a glass-knife is employed to cut a piece of tubing before making a join, it should always be remembered that the roughened line of the cut, together possibly with the inclusion of heavy metals from the knife, causes a stain in the join; this stain, apart from the trace of colour from the metals, consists of a mass of tiny air bubbles, trapped in the roughness of the glass and fused in. The more careful the knife-cut the less may this stain become, but it is almost impossible to eliminate it. Apart from the use of the glass-knife, different methods of cutting the glass may give greater or less stain; the diamond is probably the best among non-production methods, and among production methods the cleanest cut is obtained when the tube is rotated against a circle of tiny oxy-gas jets followed by rotating it against a wetted steel or abrasive wheel. It is proposed to describe these and other methods in the next article. For ordinary glass blowing, when a clean join is particularly required, a knife should not be employed, but the glass end should be drawn down, the tip blown out and the end heated and tooled out to the original size; overheating should be avoided as this again is detectible through loss of soda or other volatile constituents from the glass. This, too, will be the subject of a later article.

Cutting with a Hacksaw

The heading is intended to be misleading, and to draw attention to a simple method of cutting and notching glass by any novice in the art and, of course, equally by the expert. It enables a cut to be made slowly but surely in the required direction without risk of a crack running where it is not intended. Actually all that is used is the hacksaw frame with a piece of wire having loops twisted on the end in the place of the blade; a softish wire is best, such as copper, iron or nichrome, the thickness for cutting purposes anything from No. 24 to No. 18 gauge and for notching up to No. 12 gauge. Copper wire is first stretched slightly to harden it. In addition is a small dish containing 180 mesh carborundum powder or other abrasive and water. The grade mentioned is good, but any other grade near this will do, preferably on the fine side.

Hacksaw Operation

Fig. 4 shows the method of operation. The glass article is clamped fairly firmly, preferably in a vice, using corrugated paper for protection. The dish of abrasive is placed on the bench beyond the vice in line with the cut, and a little wet abrasive is picked up in the finger and thumb of the left hand and loosely held about the wire so that the wire may slide through them, maintaining on itself a layer of the abrasive. It is now only necessary to "saw" in the ordinary way, applying only light pressure and picking up a little more abrasive as necessary. Care should be taken not to let the wire jam by allowing the saw to get out of line with the cut, as this may cause a small chip of glass to flake off. Some practice may also be required to maintain a straight cut, but generally it is best to cut vertically downwards, keeping the frame of the saw upright. As a corollary, of course, the cut may be made to follow any required curved course. Furthermore, starting from a hole drilled, for instance, in a sheet of glass and by threading the wire through it before attaching to the saw, any shape may be cut out of the centre.

It must be emphasised that the cutting action is slow, though not unreasonably so, but it is sure and safe and is suited for specialised work. It will probably be of more value to the laboratory technician than in a glass-blowing works, as the former is not usually so well equipped.

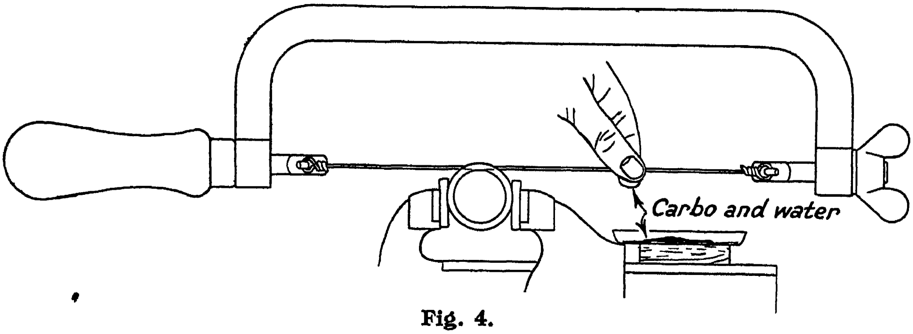


Fig. 4.

PETROLEUM SEARCH IN AUSTRALIA

Shell's Queensland Programme

THE Shell Company of Australia, Ltd., is to renew immediately the search for oil in Australia. A four-year plan has been approved by the Government of Queensland, involving a total expenditure of £1 million by 1951 and envisaging exploration and drilling work over a territory of about 50,000 square miles. The two areas to be investigated have already been fully surveyed. It is hoped that the results of this work will give the lie to those who hold the view that Australia is a barren continent as regards the occurrence of natural oil deposits.

U.K. and U.S. Equipment

Australian materials are to be used as far as possible, but since there is no domestic manufacture of drilling equipment, etc., orders have been placed both in this country and in the United States. It is the company's policy to train Australians in oil drilling, and a number of persons who had been sent to oilfields of the Shell group overseas to be given training in drilling, are already available for work in Queensland.

The search work will be carried out by Shell (Queensland) Development (Pty.), Ltd., a subsidiary of the Shell group. It is not generally known that field investigations were actively carried out in Queensland between 1940 and 1942, by some 50 oil experts, but their activities had to be suspended owing to the war. However, mapping, geo-physical and topographical surveys had been carried out, as well as an aerial survey of the country.

To 10,000 Feet

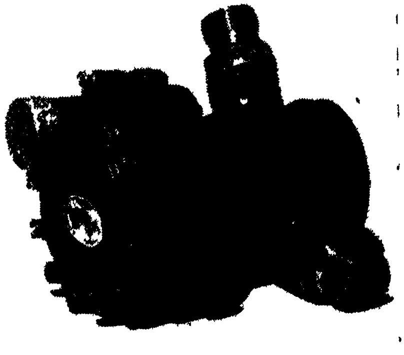
This work has meant a considerable saving of time and has made possible the sub-surface investigation which is now about to begin. It will involve the drilling of some thirty test wells with an aggregate depth of 50,000 ft., to determine the best site for deep drilling. It is expected that a well will be brought down to about 10,000 ft., *i.e.*, the deepest well ever drilled in the Commonwealth, involving an outlay of no less than £600,000.

NEW METERING PUMP

At Olympia Exhibition

NOTABLE among the range of equipment being shown by Bryce Fuel Injection, Ltd., at the Marine and Engineering Exhibition at Olympia this week is an entirely new volumetric metering pump. This is capable of delivering fluid at a constant volume, regardless of viscosity, pressure or suction. A micro-volumetric control of the fluid is provided at all times. The pump is gearless, gives a pulseless flow, is immediately adjustable for setting and has a pumping range up to 50 gal. per hour. It has wide application in many spheres of industry.

A representative selection of Bryce fuel-injection equipment is also shown on this stand, and in addition to the company's range of single-cylinder pumps, injectors and nozzles, of special interest is an all-speed hydraulic governor to govern engines operating over a wide speed range. It secures an immediate response to the controls that is a feature of the petrol engine and has so far been lacking in the control of compression-ignition power units. The working fluid is fuel oil as used in the injection pump.



Volumetric metering pump

(*Continued from page* 291)

If this is done there is no difficulty in maintaining the six per hour rate regardless of the physical form of the material to be tested.

An outstanding advantage of this method of comparison is that it independent of the physical state of the substance being tested, because the amount of X-ray absorption by a given mass of material is always the same, whether the material is hot or cold, gaseous liquid or solid. For example, the absorption per gram is the same in steam, in water and in ice. Similarly, because X-ray absorption is an atomic property, measurements will be identical when an element is alone and when it is in chemical combination. An oxygen atom, for instance, will register the same whether it is an element or in any oxygen compound.

German and Japanese Technical Reports

THE following are among the latest German and Japanese Technical Reports, copies of which are obtainable from H.M. Stationery Office at the prices quoted.

BIOS 78. Some aspects of German powder metallurgy (preliminary assessment) (2s. 6d.).

BIOS 303. Production of luminous compounds at the works of Auer Gesellschaft A.G. (2s.).

BIOS 1046. German carbide and cyanamide industry. Manufacture of calcium cyanamide (2s. 6d.).

BIOS 1148. Anthraquinone. Manufacture by air oxidation of anthracene at I.G. Farbenindustrie, Ludwigshafen (2s).

BIOS 1149. I.G. Farbenindustrie: The manufacture of certain fast bases and their intermediates and of intermediates for naphthol as products, etc. (14s.).

BIOS 1152. I.G. Farbenindustrie. The manufacture of miscellaneous naphthalene intermediates (11s. 6d.).

BIOS 1154. Some miscellaneous organic intermediates and products: Manufacture (mainly) by I.G. Farbenindustrie (4s. 6d.).

BIOS 1161. Emulsion polymerisation of vinyl acetate (1s. 6d.).

BIOS 1166. Synthetic rubber. Interrogation of Dr. Bayer and Dr. Roelig of I G. Farbenindustrie A.G., Leverkusen. (3s. 6d.).

BIOS 1191. Thermo-plastic and thermo-setting resins. Interrogation of Dr. Eisenmann (Dynamit A.G. Troisdorf) (3s.).

BIOS 1291. German acetylene chemical industry. Vinyl acetate monomer (3s. 6d.).

BIOS 1293. German acetylene chemical industry. Monovinyl acetylene. (1s.)

BIOS 1301. The electro-chemical industry. Germany (5s. 6d.).

BIOS 1366. The production in Germany of extrude sections and tubes in aluminium and magnesium alloys (12s.).

BIOS 1381. Hydrogen peroxide plant at Bad Lauterberg. Interrogation of Dr. W. Picning (1s. 6d.).

BIOS 1399. The production of carbon black from carbon monoxide (1s. 6d.).

BIOS 1402. The German manufacture of certain inorganic pigments (20s.).

BIOS 1409. Cold Impact extrusion of aluminium, etc. (3s. 6d.).

BIOS 1412. Vinyl acetate, vapour phase process (2s. 6d.).

BIOS 1414. Hydrogen peroxide. Summary of investigations carried out at Leverkussen on synthetic methods. I.G. Farbenindustrie (3s.).

BIOS 1418. Manufacture and applications of polyvinyl alcohol (4s.).

BIOS 1430. E. Merck, Darmstadt: Hydrogen peroxide solution, perhydrol and perhydrit (urea hydrogen peroxide) (3s. 6d.).

BIOS 1432. Kalichemie, Honningen: Barium compounds, hydrogen, peroxide, sodium perborate, sodium percarbonate (3s.).

BIOS 1433. I.G. Farbenindustrie A.G. The manufacture of triphenylmethane dyestuffs at Hoechst, Ludwigshafen and Leverkusen (13s.).

BIOS 1446. Some targets of ceramic interest in the Berlin area (3s. 6d.).

FIAT 757. The production of potassium permanganate and manganese chloride. (s.)

FIAT 878. Melting and casting of German silver alloys (2s. 6d.).

FIAT 955. Special mechanical features of Linde-Frankl oxygen plants (4s. 6d.).

FIAT 984. Phthalic anhydride, manufactured at I.G. Farbenindustrie, Uerdingen. (2s.)

FIAT 1025. Production of acrylonitrile at Leverkusen (1s. 6d.).

FIAT 1049. Tartaric acid processes in Germany (1s. 6d.).

FIAT 1071. Chlorinated polyvinyl chloride (2s.).

FIAT 1088. Films of pure and mixed long chain dibasic esters. Report in German (2s. 6d.).

FIAT 1095. Vapour-liquid equilibria of binary hydrocarbon mixtures. Report in German (2s. 6d.).

BIOS/JAP/PR/668/9. Sources of phosphate for Japan (2s. 6d.).

BIOS/JAP/PR/1158. Economic controls in the Japanese coal industry (4s. 6d.).

BIOS/JAP/PR/1666. The rayon and synthetic fibre industry of Japan (30s.).

JIOA 15. Rammelsberg lead—zinc mine (1s.).

JIOA 20. Theodolite manufacture (1s.).

JIOA 80. Pierre Demart. Underground gasification of coal (1s.).

German Explosives Recovery.—At the Allendorf chemical plant, Hesse, the installation of plant for the recovery of chemicals from explosives has recently been started. Capacity is to reach 200 tons per day in three months. The Aschau plant at Muehldorf in Bavaria is reported to be converting smokeless powder into nitrocellulose, suitable for lacquers and cements.

Technical Publications

The British Rubber Development Board has just published a further study of "Positex," the modified rubber latex with a reversed (positive) charge on the particles, in relation to the treatment with it of woollen and worsted yarns and fabrics. The reach, of which the results are described in considerable detail in this booklet, was carried out in the laboratories of the Wool Industries Research Association and this review by Dr. C. M. Blow is authoritative and supplies the latest data available.

* * *

Wild-Barfield Electric Furnaces, Ltd., are about to issue a booklet describing a newly developed atmosphere application in association with Paragen burners which, it is claimed, represents a noteworthy advance in the field of controlled atmospheres in the heat treatment of metals. The method has resulted in important reductions of scaling and decarburisation. A practical illustration will be given at the firm's stand at the Marine and Engineering Exhibition.

* * *

Scientific descriptions of some of a wide range of industrial chemicals—principally amines and amine derivatives—manufactured by Robinson Bros., Ltd., at West Bromwich and Oldbury, Birmingham, are provided in the booklet "Chemicals," just issued.

* * *

The technique of "commercialising scientific knowledge" has gained much ground through the activities of A.S.L.I.B. (the Association of Special Libraries and Information Bureaux), of whose meeting last year—to discuss industrial information services a full report (members 3s., non-members 4s.) has now been published by A.S.L.I.B. The papers and discussion reviewed from many angles, subjects such as the functions of an industrial information officer, the organisation of information services and the requirements of special libraries.

* * *

Protracted shortage having conferred on coal a scarcity value not greatly less than that of the more familiar precious minerals, there is a good deal to be said for detailed studies of conservation methods, of which "The Handling and Storage of Coal" produced by a special committee of the Ministry of Fuel and distributed free of charge by H.M.S.O., is a useful example. The booklet (Fuel Efficiency Bulletin No. 49) provides expert information on basic matters, such as stocking, measurement of coal stocks, segregation and blending.

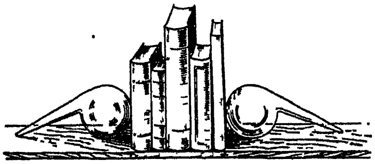
* * *

An article which will command widespread interest—contained in the new issue of Philips Technical Review, Vol. 9 No. 2 (Philips Lamps, Ltd.)—is devoted to a detailed description of the electron microscope by Mr. J. B. le Poole, director of the Institute for Electronic Microscopy at Delft, who constructed the model described. It was completed in 1944 and used for one month and was then dismantled to prevent its capture by the enemy. After the liberation, it was re-assembled and put into use again. Electron beams can be refracted and focused by means of magnetic or electrostatic lenses using the terminology of the optical microscope and an image thereby obtained. Among the advantages conferred by the electron microscope discussed in the article, is the ability to get an electron diffraction pattern of an object or specimen which has been studied microscopically, thus obtaining easier identification of the materials under investigation. Several applications of this kind of the electron microscope are examined.

* * *

The leading article in No. 1 of the Sulzer Technical Review for the current year deals with the stability of water distribution in the forced-circulation heating surfaces of steam generators. The conditions under which certain disturbances will occur are deduced and formulated in simple mathematical terms, and an examination is made of the behaviour of a few specially important systems when affected by disturbances of distribution. The number contains a description of the Disintegrator developed by Sulzer Brothers for sewage clarifying plant. This machine reduces bulky screenings which can then be used in digesting tanks for the production of useful substances such as manure and methane gas. A further article deals with the influence of heat treatment on the hardness and structure of a chromium-silicon valve steel and describes research carried out in the Sulzer metallurgical laboratory.

Canada's Chemical Import from U.S.A.—Canadian imports of chemicals and allied products from the United States in 1947 have so far been exceeding similar imports at the same time last year, rising in the first four months of this year to $32,972,304 as compared with $27,853,972 in the same period last year. Included are $280,492 worth of coal-tar base or salt for dyes amounting to $370,437 pounds, 7650 worth of camwood and sumac and extract (1417 cwt.) and $235,735 of chemical composition for dyeing extract (1417 cwt.) as well as $927 iron and red liquor for dyeing (164 cwt.).



A CHEMIST'S BOOKSHELF

Powder Metallurgy: Principles and Methods. By Dr. Henry H. Hausner. New York. Chemical Publishing Co., Inc., Brooklyn, 2. 1947, pp. vii-298. $7.00.

Apart from numerous articles in the technical Press and a fairly long list of patent specifications, the powder metallurgist's library concerned specifically with this subject should now comprise three textbooks and two symposia: the former by Drs. Jones, Baëza and Hausner, and the two symposia issued respectively by the American Society of Metals in 1943 (Editor John Wulff) and by the Iron & Steel Institute, London, in 1947. The subject, in its widest implications, covers, of course, the domains of general metallurgy and physical chemistry which demand their own bibliography as well.

The work comprises (1) general data on powder metallurgy, including glossary, principles, manufacturing methods, powders commercially available, and comparison of sintered with fused materials; (2) graphs and tables on powder metallurgical methods, showing the effects of particle size, compacting pressure and sintering conditions, subsequent treatment, and of composition; (3) bibliography. An extensive list of journals noted in the bibliography, with abbreviations, together with a good index are included. References are up to end of 1945 and the glossary is taken from the American symposium. Under "Principles" are noted five different processes for production of a binary compound or mixture, together with graphs relating density, hardness, shrinkage, etc., with the various factors: particle size, pressure, and so forth. Part 2 on methods should form a useful work of reference, containing much information and including graphs and tables.

It contains also much hitherto unpublished data by the author. An example is on page 62, showing the effects of different types of copper powder on hardness of tungsten-copper compacts. Composition was 84 per cent tungsten, 15.5 per cent copper, 0.5 per cent nickel; compacting pressure 25 tons/sq. in., sintering temperature 1040° C., time 2 hrs., atmosphere, hydrogen. Five different bars of copper were A, reduced, fine; B, electrolytic, coarse; C, electrolytic, fine; D, electrolytic, light fine; and E, reduced, coarse. The chart shows Brinell hardness of the five bar materials forged, and the five annealed after forging. Highest hardness was in C forged (260), while the lowest was in E annealed after forging (198). In this latter category (annealed) C was somewhat harder than B, and very much harder than the other three. The bibliography contains over a thousand references, and would seem to be relatively complete, so far as journals are concerned, for there are practically no references to the long and rapidly growing list of patents. Sir Henry Bessemer's pioneer work on brass and bronze powders for paints, which he started in Baxter House, St. Pancras, in 1843 is, rather unaccountably, omitted. On the other hand, a large number of references are given from Russian journals, indicating a considerable amount of research in powder metallurgy in that country.

Caribbean Mission Recommendations

Among the recommendations of the Caribbean Commission and the West Indian Conference are some for utilising British Guiana's silica sand for a glass and bottle industry, manufacturing cement in Trinidad and Jamaica, and producing oil in commercial quantities in Barbados where arrangements are already being made to utilise supplies of natural gas. These developments, together with the exploitation of the mineral and forest resources of individual territories, will help to balance the economy of the West Indies, whose economic position at the end of 1946 was materially better than in 1939.

Celanese Expansion Programme

"The expansion of our plant facilities is continuing," reported Mr. Harold Blancke, president of the Celanese Corporation of America, recently. $17,441,361 have been expended during the first half of 1947, compared with $20,476,451 for the whole year 1946. Considerable portion of this expansion programme is nearing completion and should play an important part in the future growth of the company. Among the latest organic chemicals now being offered to industry by our company as a result of additional facilities installed at the Bishop, Texas, plant are methyl ethyl ketone, methylal and tetrahydrofuran.

Home News Items

Industrial Accident Prevention. — The Royal Society for the Prevention of Accidents is to hold a National Safety Congress at Brighton in October next on the occasion of its Silver Jubilee.

Oil Paints Specification.—British Standard Specification No. 929:1947, which relates to ready-mixed oil paints, has just been revised, and copies may be obtained from the British Standards Institution, 28 Victoria Street, S.W.1.

Visit to Engineering Exhibition.—At the invitation of the organisers of the Engineering and Marine Exhibition, the Institution of Chemical Engineers is to be entertained to lunch at the Exhibition on September 4. Members will receive free tickets of admission for the occasion.

Fire at Port Sunlight.—An air-tight store chamber containing 50 tons of barley, caught fire on Sunday last at the Port Sunlight works of Lever Brothers. The works' fire brigade, together with other employees of the firm, battled with the blaze all night and managed to bring it under control by Monday.

Record Output of Ironfoundries.—Output of iron castings in the second quarter of this year amounted to 714,787 tons, which is equivalent to an annual rate of production of 2.86 million tons. This, according to the Council of Ironfoundry Associations, is the highest output ever officially recorded and has been achieved in spite of shortages of skilled labour and essential materials.

Packaging and Sales Promotion.—The British Sales Promotion Association, which suspended its monthly discussion meetings during the war, is to resume them again on Tuesday, September 9, at 6.30 p.m. at the Charing Cross Hotel, London, W.C.2, when Dr. G. L. Riddell, Director of Research, Printing and Allied Trades Research Association, will give an address on " Efficiency in Packaging." Mr. Charles T. Howard, chairman of the Association, will preside.

" Shop Window " Displays for Scottish Chemicals.—The chemical industries of Scotland are to have a " shop wondow " in Edinburgh and eventually also in Glasgow, Dundee and Aberdeen as a result of a new effort by the Scottish Council (Development and Industry). The Council plans to stage a series of displays of which the first is to be given soon in Edinburgh. It is intended to create displays of general industrial interest in order to familiarise the Scottish people with the products of their own factories.

Steel Nationalisation.—The executive Committee of the Iron and Steel Trades Confederation in a unanimous resolution passed at its quarterly meeting demands the " full and immediate nationalisation of the iron and steel industry."

Works Visit.—The Manchester section of the Oil and Colour Chemists' Association plans to visit the works and laboratories of the Cromford Colour Company, near Matlock, and the Hopton Mining Company's barytes mine at Brassington, on September 19.

Celanese Factory Fire.—A fire which broke out at the British Celanese factory at Spandon, near Derby, last Sunday, and which engaged 100 firemen for several hours was confined to a building used for the storage of cellulose acetate. Three floors of the building collapsed.

British Insecticide to Save Uruguayan Herd.—A York aircraft left Heath Row Airport last week with a rush consignment of a new insecticide for Uruguay, where valuable beef herds are threatened by the blue tick, notorious disease carrier and one of the most deadly of all cattle parasites.

Metal Finishing Journal.—*Electroplating* is the title of a new technical monthly dealing with plating, anodising, enamelling, pickling, lacquering, bronzing, polishing and phosphating; the first issue will appear in November. The editor is Mr. C. R. Draper, and the subscription rate 37s. 6d. a year.

July Coal Figures.—The average weekly output of coal in July amounted to 3,332,200 tons (including 219,000 tons opencast). This is 519,100 tons less than was produced in the average June week and 159,100 tons below the figure for the corresponding period last year. Distributed stocks increased by 1¼ million tons. On August 3 there were 2.4 million tons more of distributed stocks in the country than at the same date last year. There were 800 more wage earners on colliery books than in June.

Chemicals Disposal Achievement.—By the end of June last the Pharmaceutical and Allied Chemicals Disposals Association, Ltd., had purchased on behalf of its members Government surplus stores to the value of approximately £165,000. The Association, which was formed in 1945 as a non-profit-making body to co-ordinate the sale and disposal of goods purchased from Government sources, has over 100 members, and expects to continue its activities until such time as Government stores are no longer offered, *i.e.*, until about March of next year.

Personal

Lord Ashfield, 73-year old deputy chairchairman of I.C.I., has been appointed by the Minister of Transport as a member of the British Transport Commission.

Mr. Peter M. Dewar, late chairman of John Dewar & Sons and a director of the Distillers Company, who died in June, left £388,919—net personalty £377,654

Miss W. G. Keepe, Manchester, who has been engaged on penicillin research for the past year, has been awarded the Wellcome Pharmaceutical Research Fellowship for the academic year beginning in October.

Dr. D. Parkinson, chief of Dunlop's compounds division, has returned from an inspection of carbon black manufacturing plants in America. In the course of his tour Dr. Parkinson gave lectures to laboratory staffs in New York, Boston, Texas and Toronto, on the use of carbon black in tyre manufacture.

Mr. H. Halliday will to-morrow relinquish his appointment as director of Refractories in the Ministry of Supply.

Dr. James W. Illingworth, research textile chemist at Fort Dunlop, Birmingham, **Mr. Norman E. L. Eyre**, in charge of the service laboratory of Messrs. Courtaulds, Ltd., and **Mr. J. L. F. McDonald**, weaving supervisor of British Celanese, have been elected Fellows of the Textile Institute at a recent meeting of the Council of the Institute at Manchester.

" Shell " Appointments

Mr. F. H. Braybrook (" Shell " Chemical Products Department) with the assistance of **Mr. W. F. Mitchell**, will head the Management of Industrial Development recently formed to advise the " Shell " board of directors on worldwide technical developments insofar as they affect the petroleum and chemical industry. **Dr. W. S. Matthews**, formerly with I.C.I., Billingham, will be responsible for the Division of Industrial Development Planning, **Mr. A. V. Billingham** and **Mr. L. W. Leyland Cole** will be in joint charge of the Market Research Division, while the Patents Division will be directed by **Mr. A. D. Koeleman**, until recently manager of the Patents Department of the N.V. Bataafsche Petroleum Maatschappij, Holland.

Obituary

Formerly an Assistant Comptroller in H.M. Patent Office, **Francis William Hodges**, aged 90, died at Wimbledon on August 21.

NEXT WEEK'S EVENTS

TUESDAY, SEPT. 2 to TUESDAY, SEPT. 9

Fuel Economy Conference of the World Power Conference, The Hague.

Princess Elizabeth

R.S.A.'s New President

H.R.H. The Princess Elizabeth has graciously accepted the invitation of the Royal Society of Arts to become its President. The Royal Family has been closely connected with the Royal Society of Arts for over a hundred years, Prince Albert having become the Society's President in 1843; it was in that capacity that he initiated the Great (Hyde Park) International Exhibition held in 1851. Other Royal Presidents have been their Royal Highnesses the Prince of Wales (later King Edward VII), The Prince of Wales (later King George V), and The Duke of Connaught. The Society, which is the third oldest of the learned societies in Britain, will shortly prepare to celebrate its second centenary in July, 1954.

Purchasing Agency in Germany

The Director of the British Purchasing Agency (Germany) has announced that a branch office for Nord-Rhein/Westfalen has been established at rooms 411/412 Steel House, Dusseldorf, where it is hoped all British commercial visitors needing information or assistance in the conclusion of export purchase contracts from the land will call. Where practicable, every assistance will be rendered to them, including the provision of personal contacts with manufacturers if desired.

The head office of the British Purchasing Agency (Germany) remains at Minden until further notice, and all correspondence in regard to exports from Germany to the United Kingdom should continue to be addressed to that office.

Novel Carton

An interesting feature at the Enterprise Scotland 1947 Exhibition, now being held at Edinburgh, is a pump carton which combines a container and a pump device. The pack, which has been made by John Laird & Son, Ltd. for George Munro's insect powder, consists of two sections, one containing the powder and the other housing a concertina air space.

Understood to be suitable for liquids and powders alike, the carton may supersede the separate spray and thus greatly simplify dusting and spraying.

Whaling Agreement

By international agreement, only seventeen whaling factory ships will sail for the Antarctic when the whaling season opens there next December. Britain's quota is three, the remainder being allocated as follows: Norway nine, Japan two, and Russia, South Africa and Holland one each.

Overseas News Items

No British Alkalis for Australia.—Because of the fuel shortage, Britain will not be in a position to supply Australia with soda ash and caustic soda in the current year.

New U.S. Insecticides.—Tetraethyl pyrophosphate and hexaethyl tetraphosphate, should be available next year after field tests have been completed this summer.

African Sodium Carbonate.—Kenya and Uganda, forming a single statistical unit, in 1946 produced 78,000 tons of sodium carbonate from Lake Magadi near Nairobi,

Further French Chemical Price Increases.—The prices of copper sulphate and of sulphur in France are shortly to be increased. Both commodities are important to France's agriculture.

U.S. Industrial Production Down.—Industrial production in the United States declined in June and the downtrend continued in the early part of July, reports the U.S. Federal Reserve Board's monthly summary of business conditions.

Malayan Tin Exports.—Malayan in shipments during July totalled 3955 tons as against 3289 tons during the previous month. Disposal was as follows: U.S.A. (3500), U.K. (105), European Continent (260), British possessions (90).

Carborundum Co. Expansion.—The Carborundum Company, Niagara Falls, has decided on an extensive expansion programme which will eventually involve an expenditure of more than fifty million dollars.

Czechoslovak Soap Industry.—Czech soap factories plan to produce 30 million cakes of soap and 7 million kilogrammes of washing powder in the quarter ending in September. This should make it possible to increase the present small ration—one 100 gramme cake a month.

Higher Brazilian Imports of British Chemicals.—The value of British chemicals imported to Brazil in May aggregated about £120,000, *i.e.* twice the amount of the previous month. She also substantially increased her imports of British non-ferrous metals.

French Chemical Prices Up.—The French Price Administration Office has increased the price for sulphuric acid (20 per cent oleum) from 358.2 francs to 431 francs per 100 kilogramme, the price of pyrites has been raised from 2050 to 2400 francs per metric ton, while the price of superphosphate and of ground phosphates has also gone up. The price for glass has been increased by some 20 per cent.

Spanish Chemical Developments.—The manufacture of cyanamide is to be taken up in Santander Province by the Union Quimica del Norte de España.

U.S. Nylons for Turkey.—A U.S. firm is reported to have agreed to supply 200,000 pairs of nylon stockings to the Turkish market.

U.S. Company to Close.—The Langeloth, Pa., plant of American Zinc and Chemical Company may soon be closed because it uses an obsolete process for the production of non-ferrous metals.

Strikes in Chile.—Production of nitrate, copper and coal in Chile has fallen off recently as a result of strikes. The Chilean president imputed communist inspiration and has sacked three ministers.

France to Build Sugar Factory in Chile.—A proposal made by French interests to set up a sugar-beet factory in Chile has been approved, and work is expected to commence in November with machinery imported from France.

Turkey Requires Reconstruction Loan.—The Turkish Government is understood to be preparing to apply to the World Bank for a 400 million-dollar loan. This credit is urgently needed for reconstruction of industry and agriculture.

European Coal Production Increase.—There was an increase of nearly 2,000,000 metric tons of coal in July from European countries compared with June. Production was 19,263,000 metric tons against 17,507,000 metric tons in June.

Postal Despatch of Penicillin to Germany Prohibited.—The British and American health authorities in Germany have banned the private import of penicillin by post in order to reduce the black market and to make self-treatment of the Forces and others more difficult.

Chilean Nitrate Prices Higher.—Owing to increased labour and transport costs, the price of Chilean nitrate has risen by $4 a ton. The Chilean Nitrate Sales Company is now quoting $42.50 a ton for nitrate fertilisers in bulk, and $45.50 a ton in bags of 100 lb. each.

Swiss-Hungarian Deal. — A Swiss textile manufacturer, Mr. J. Dainicker, and a representative of the Swiss iron industry, Mr. Kunz, managing director of the Von Moos Iron Works, have visited Hungary to explore the possibilities of finishing work on a hire basis. Trade between Hungary and Switzerland is developing satisfactorily and barter has already exceeded the agreed quantities.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Satisfaction

FLEETWOOD CHEMICAL CO. LTD., (old co.), London, S.E. (M.S. 30/8/47). Satisfaction July 16, of charge registered September 12, 1946.

Company News

The nominal capital of **Boots Pure Drug Company Ltd.** has been increased beyond the registered capital of £3,000,000 by £1,000,000, in 4,000,000 ordinary shares of 5s.

The nominal capital of **Miles Laboratories Ltd.**, 12 Whitehall, London, S.W.1, has been increased beyond the registered capital of £10,000, by £40,000, in £1 shares.

The name of **Delanium Ltd.**, 140 Battersea Park Road, London, S.W.11, has been changed to **Powell Duffryn Research Laboratories, Ltd.**, as from June 25, 1947.

The name of **Wilsons (Bradford), Ltd.**, 5 Godwin Street, Bradford, has been changed to **Wilsons Chemical Products Limited** as from June 25, 1947.

The name of **Newcastle-upon-Tyne Zinc Oxide Company Ltd.**, 66 John Street, Sunderland, has been changed to **Durham Chemicals Limited** as from July 1, 1947.

The nominal capital of **Thornton and Ross Ltd.**, manufacturing chemists, etc., Linthwaite, Huddersfield, has been increased beyond the registered capital of £7000 by £3000, in £1 ordinary shares.

The name of **Cross and Max (Agencies), Ltd.**, chemicals, etc., 17-18 Bishops Court, Old Bailey, London, E.C.4, has been changed to **Cross and Max, Ltd.**, as from June 28, 1947.

Metal Traders Ltd. has announced a profit for the year ended March 31 of £78,073, a figure which compares with £9545 for the previous year. A final dividend of 212½ per cent is recommended, making a total of 250 per cent for the year.

The nominal capital of **Genatosan Trust Ltd.**, Harvest House, Ipswich, has been increased beyond the registered capital of £1,297,150 by £1,000,000, in £1 3½ per cent cum. red. pref. shares. The capital is now £2,297,150 in 1,000,000 red. pref. shares of £1 and 2,594,300 ordinary shares of 10s.

On September 19 **Borax Consolidated** will pay an interim dividend on the £1,500,000 deferred ordinary stock of 4 per cent less tax in respect of the year ending September 30. This is the first interim dividend for some years. Last year's distribution was 10 per cent less tax, and included a 2½ per cent bonus.

O-Cedar Ltd. polish manufacturers is to raise the dividend on its "A" and "B" shares for the year ended March 31, from 50 per cent to 60 per cent (less tax). The year's profits amounted to £31,323 as compared with £31,759 in the previous year. Net profits for the same two years were £11,323 and £7156 respectively.

New Companies Registered

Aralkyl Chemicals Ltd. (440,962).—Private company. Capital £1000 in £1 shares. Subscribers: L. Jackson, C.A., and N. E. Ollis, L. Jackson is the first director. Registered office: 10 Bedford Street, W.C.2.

Claredene Trading Company Ltd. (440,974).—Private company. Capital £1000 in £1 shares. Importers and exporters of and dealers in foodstuffs, chemicals, machinery, textiles, leather goods, etc. Directors: K. Lawton and G. Lawton. Secretary: W. F. Radford. Registered office: 44 Bedford Row, W.C.1.

Moray Chemical Products Ltd. (440,031).—Private company. Capital £20,000 in 20,000 shares of £1 each. Soap manufacturers, pharmaceutical, manufacturing and general chemists and druggists, etc. Subscribers: H. Mishon, and A. Kennedy. Solicitors: Billinghurst, Wood and Pope, 7 Bucklersbury, E.C.4.

Brennan Developments Ltd. (441,032).—Private company. Capital £6000 in £1 shares. Manufacturers, producers, designers, assemblers and repairers of and dealers in gas discharge and fluorescent tubes, fluorescent chemicals, electric lamps, gas discharge and fluorescent signs, etc. Subscribers: E. Hunter and C. Chudleigh. Secretary, E. Hunter. Registered office: 206 Grove End Gardens, Grove End Road, N.W.8.

Simonswood Manufacturing Co. Ltd. (441,022).—Private company. Capital £20,000 in £1 shares. Chemical manufacturers, glass manufacturers, engineers, motor manufacturers, timber merchants, china and pottery manufacturers, rubber and plastic manufacturers, textile and paper manufacturers, and various other businesses. Subscribers: F. H. Carlin and A. Walmersley. Registered office: Ashcroft Road, Kirby Trading Estate, Kirby, near Liverpool.

Chemical and Allied Stocks and Shares

EARLIER in the week, stock markets were subdued, with business in most sections declining further, buyers holding off pending news of the Government's crisis measures. British Funds made further headway, fixed interest bearing stocks being in better demand, but in contrast industrial shares remained dull in the absence of buyers, although some of the leading shares continued to attract attention as a hedge against the danger of increased inflation. Moreover, sentiment was affected by fears that for the present, the non-convertibility of sterling may lead to contraction in international trade.

Chemical shares were generally steady, and Imperial Chemical at 45s. rallied moderately, partly because of the group's big interest in home and export trade. Moreover, the £100 million plan for agricultural expansion and development should lead to growth in demand for some classes of chemicals, fertilisers, etc. Fisons have been relatively firm for a similar reason, business again being around 60s. Elsewhere, B. Laporte were 92s. 6d., and W. J. Bush marked 87s. 6d. Monsanto Chemicals 5s. shares changed hands around 51s. 6d., and Greeff-Chemicals 5s. shares were 15s. 3d. In other directions, Turner & Newall declined, but later made a small rally to 74s., but United Molasses were down to 47s. 9d., and the units of the Distillers Co. fell sharply to 131s. 3d. despite the impending consolidated accounts and final dividend. British Plaster Board were down to 24s. 9d. and Associated Cement 66s., reflecting fears of slowing down of the building programme. Lever & Unilever eased to 50s., but Lever N.V. strengthened to 46s. 9d. British Glues & Chemicals 4s. ordinary were 19s. 9d. or within 3d. of the level a week ago. General Refractories were 22s., and in other directions, Amalgamated Metal firmed up to 16s., attention being drawn to the favourable yield and to hopes that the London Metal Exchange may reopen next year. Imperial Smelting were 18s. 6d., British Oxygen 90s., and British Aluminium became firmer at 42s. on the company's strong position and the probability that demand for aluminium will continue to increase.

Iron and steels have been steadier, despite the latest news of trade union requests for early nationalisation. Guest Keen rallied to 43s. 3d., and Stewarts & Lloyds became firmer at 48s. 3d., but on the other hand Tube Investments gave ground at £6 3/16, and Allied Ironfounders were no better than 51s. 6d. Ruston & Hornsby strengthened to 60s., and shares of other companies making tractors and agricultural equipment also received some attention. Triplex Glass at 29s. regained part of an earlier decline. The better tendency in textiles, which recently developed, was not maintained, but price movements were small and unimportant. Calico Printers were 20s. 6d. awaiting the dividend decision, Bradford Dyers 21s., and Bleachers 10s. 7½d., Borax Consolidated deferred at 50s. remained unaffected by the decision to initiate interim dividends, although this presumably indicates that the level of profits is good and holds out the possibility of a higher total payment for the year.

Elsewhere, Boots Drug were 56s. 3d., Sangers 34s. 6d., Griffiths Hughes 45s., and Beechams deferred 22s. 6d. Oil shares have receded in the absence of demand Iranian became steadier at £9, Burmah Oil were 81s. 3d., Lobitos 67s. 6d., and Shell 95s. 7½d., but preference shares of the leading companies made higher prices.

British Chemical Prices

Market Reports

MANCHESTER.—Holiday influences have been rather less in evidence on the Manchester chemical market during the past week and new business in the alkalis and other heavy products has been on a fair scale. This has included both home and export buying. Contract deliveries are being called for steadily, but there is considerable difficulty in the case of certain materials for allocations to keep abreast of requirements, especially in soda ash and other chemicals. In fertilisers a moderate trade has been reported. There has been little change in the position of the tar products, the majority of which are being taken up to the full extent of the quantities available.

GLASGOW.—In the Scottish chemical market during the past week, business has been fairly active. There is a large unsatisfied demand for chemicals for the paint trade, *viz.*, zinc oxide, white lead, lithopone and white barytes. The demand for extra supplies of soda ash and caustic soda for industries on essential business continues unabated. There are no signs of an improvement in the supply position of Glauber salts and trisodium phosphate. All chemicals available have been absorbed without difficulty. In the export market, inquiries are still numerous and a regular percentage of orders is still being booked. Demand from the Argentine has been noteworthy, and it seems likely that this market will be adversely affected by the sterling restriction.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Manufacture of vat dyestuffs.—Ciba, Ltd. February 1, 1946. 3034-35/1947.

Manufacture of reducing agents and dyestuff preparations containing them.—Ciba, Ltd. February 1, 1946. 3036/1947.

Selective calcination of dolomite.—Dorr Co. November 3, 1945. 18065/1947.

Mordanting dyestuffs.—E.I. Du Pont de Nemour & Co. January 31, 1946. 2240/1947.

Preparation of peracids.—E.I. Du Pont de Nemours & Co. February 5, 1940. 18431/1947.

Ceramic composition.—General Motors Corporation. February 1, 1940. 18218/1947.

Hydrocarbon liquid containers.—Glenn L. Martin Co. April 1, 1942. 18132/1947.

Catalyst manufacture.—Houdry Process Corporation. January 30, 1946. 1107-10/1947.

Process of hydrocarbon conversion.—Houdry Process Corporation. January 30, 1946. 1231-32/1947.

Thermochemical scarfing method and apparatus.—Linde Air Products Co. January 31, 1946. 1704/1947.

Apparatus for dispensing liquefied gases.—Linde Air Products Co. January 31, 1946. 1705/1947.

Method of preparing methyl *p*-vinyl benzoate and the improved methyl *p*-vinyl benzoate and its acid derivative *p*-vinyl benzoic acids resulting therefrom.—Monsanto Chemical Co. February 1, 1946. 2106/1947.

Stabilisation of soap.—Monsanto Chemical Co. April 25, 1940. 17994/1947.

Processes of producing condensation products, and the improved condensation product resulting therefrom, and processes of preserving rubber and the vulcanised rubber products resulting therefrom.—Monsanto Chemical Co. December 22, 1945. 18270-71/1947.

Method of making a chemical product and the improved chemical product resulting therefrom.—Monsanto Chemical Co. July 26, 1940. 18272/1947.

Manufacture of alkylic ethers of glycols.—Montecatini, Soc. Generale per l'Industria Mineraria E. Chimica. October 5, 1942. 18303/1947.

Process for the production of halogenated fatty acids.—Mo Och Domojo A/B. January 31, 1946. 2527/1947.

Solvent extraction of glyceride oils.—Pittsburgh Plate Glass Co. January 17, 1939. 18137/1947.

Hydrolysis of organic esters.—Soc. Normande de Produits Chimiques. January 29, 1946. 10930/1947.

Manufacture of alkali chlorites starting from chlorine dioxide.—Solvay & Cie. January 31, 1946. 567-8/1947.

Wetting agents, detergents and emulsifiers.—Standard Oil Development Co. November 12, 1938. 18007/1947.

Separation of isobutylene from hydrocarbon mixtures.—Standard Oil Development Co. November 19, 1938. 18008/1947.

Alkylated thiophene compounds and production thereof.—Texaco Development Corporation. February 1, 1946. 2104/1947.

Alloy and an article of manufacture made therefrom.—Timken Roller Bearing Co. February 26, 1941. 18139/1947.

Pigment compositions.—American Cyanamid Co. January 25, 1946. 444/1947.

Lubricating compositions and process of preparing same.—American Cyanamid Co. January 26, 1946. 520/1947.

Lubricating compositions and process of preparing same.—American Cyanamid Co. January 26, 1946. 521/1947.

Production of heat insulating materials.—British Celanese, Ltd. January 23, 1946. 32264/1946.

Manufacture of synthetic resins.—British Celanese, Ltd. January 26, 1946. 1509/1947.

Process for the manufacture of thioglycolic acid or its salts.—G. Carpeni, and P. Souchay. January 24, 1946. 34102-3/1946.

Carbon black.—Columbian Carbon Co. January 28, 1946. 3127/1947.

Catalytic endothermic reactions, and in particular to the production of hydrocyanic acid.—E.I. Du Pont de Nemours & Co. October 9, 1945. 30112/1946.

Electrolytic processes.—E.I. Du Pont de Nemours & Co. January 23, 1946. 2116-17/1947.

Plastic materials and methods of production thereof.—E.I. Du Pont de Nemours & Co. January 25, 1946. 2261/1947.

Bleaching of wood pulp.—E.I. Du Pont de Nemours & Co. January 24, 1946. 14421/1947.

Production of butadiene.—Koppers Co., Inc. January 24, 1946. 30022/1946.

Process for producing polyhydric alcohols, or ethers thereof. Mo Och Domojo A/B. October 13, 1945. 29709/1946.

Organic lubricating composition.—N.V. de Bataafsche Petroleum Maatschappij. January 23, 1946. 1265/1947.

Lubricating compositions.—N.V. de Bataafsche Petroleum Maatschappij. January 25, 1946. 1266/1947.

Bituminous compositions.—N.V. de Bataafsche Petroleum Maatschappij. January 26, 1946. 2054/1947.

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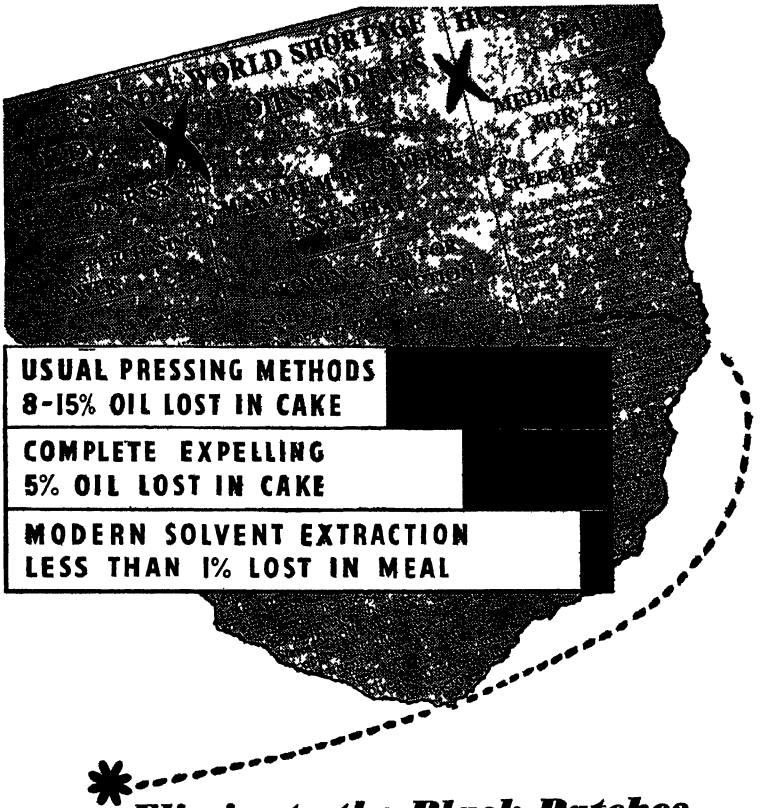

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Process for the manufacture of dispersions of reaction products of high molecular weight from di-halogen hydrocarbons and polysulphides.—N.V. de Bataafsche Petroleum Maatschappij. July 15, 1941. 17756/1947.

Process for the manufacture of concentrated stable aqueous dispersions of reaction products of di-halogen alkanes with polysulphides.—N.V. de Bataafsche Petroleum Maatschappij. January 3, 1942 17757/1947.

Process for the manufacture of amino ethers.—Parke, Davis & Co. April 18, 1944. 17917/1947.

Process of producing chlorites from chlorine dioxide.—Solvay & Cie. Dec. 15, 1945. 32538/1946.

B-aminopropionitriles and method of producing same.—American Cyanamid Co. January 8, 1946. 38126/1946.

Beater constructions. — American Cyanamid Co. February 5, 1945. 17009/1947.

Process for manufacturing of vinylesters of carboxylic acids.—Bata, Narodni Podnik. September 15, 1941. 16833/1947.

Process for producing high molecular polyamides.—Bata, Narodni Podnik. Septem-15, 1941. 16834/1947.

Process for concentration of acetic acid, eventually elimination of water therefrom. —Bata, Narodni Podnik. October 16, 1941. 16835/1947.

Process and device for producing lactams. —Bata, Narodni Podnik. December 5, 1941. 16836/1947.

Process of producing oximes.—Bata, Narodni Podnik. March 26, 1942. 16837-38/1947.

Process and device for producing lactams. —Bata, Narodni Podnik. May 12, 1942. 16840/1947.

Method of isolating cyclic lactams.—Bata, Narodni Podnik. September 24, 1942. 16841-42/1947.

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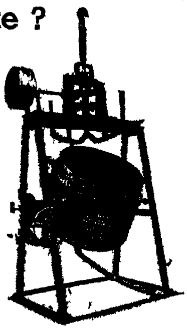

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The Pretensions of Labour

THE social history of our times reveals a change over the past 150 years that will surely delight and interest historians of centuries yet to come. It is rooted deep in human nature. Man is a dominating animal; he is naturally lazy and dislikes exertion. In earlier days, he solved the problem of living without hard work by the institution of slavery. Captives taken in battle or by raids into other districts or other countries were put to work without pay and with hard and often cruel task-masters to see that such keep as they received was fully earned. We do not seem to have changed greatly, for we, the British, still retain German captives in our midst, without asking whether they wish to return home or no. That being so, we can hardly cast scorn upon the Victorians or the Americans for their treatment of the submerged classes. American slavery has ended but it is only necessary to read any American paper that deals with social conditions to know that its aftermath is still present in the undoubted difficulties of a community of men of different colours. The Victorians in Britain treated their workpeople nearly as badly—sometimes worse. Those unfortunate folk were equally slaves, slaves of their need to keep themselves alive by earning sufficient to buy the bare necessities of life. The women who toiled half-naked in our coalmines, the children of tender age tied to looms for 15 hours a day and made to keep awake by the overseer's lash, were manifestations of a disregard of human rights at the beginning of the industrial revolution that have left their mark ever since. Reforms came hard, and were bitterly contested by the exploiters and the exploited. Not until 1901, for example, were children under the age of 12 barred from the factory, and factory conditions made reasonably good. Good working conditions came not so much from the good-will of the employer as from the enforcement of regulations by Inspectors appointed for that purpose by the Conservative and Liberal Governments of the day.

These present-day conditions are jealously guarded by those who organise the wage-earners of the country. The circumstances that gave rise to them have long since passed and no employer would wish to see them return. Unfortunately, the wage-earners—we will not describe them as " workers " for obvious reasons—cannot forget the sufferings of their ancestors, and are badly led by those who preach class hatred. We are not a united nation; only war seems to unite us. The situation today seems to be that instead of the employers exploiting their employees as they did generations ago when they (the employers) had the upper hand, free education has now brought about a state of affairs where the employees are ruthlessly determined to exploit their position to work less and play more. It is leadership that has been at fault. Most people in this country have neither the capacity to think deeply nor knowledge of the facts upon which to base conclusions upon major issues. They have been lured by specious promises of 40-hour weeks, or even less, of a paradise of leisure, of control over the businesses that employ them. It is not the fault of the miners that they have secured a five-day week without any

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intention of honouring their side of the bargain; the fault lies with their new leaders who have promised them less work, more pay and impossibly ideal conditions of work. " By the sweat of thy brow shalt thou eat bread," is still as true as it was 2000 years ago.

These pretensions of organised labour have been largely responsible in bringing the country to its present pass. We shall all suffer alike and the experience may teach some much-needed lessons. Already the capacity of labour to govern has been exposed. The pretensions of labour leaders to control great businesses successfully will prove equally hollow. The expressed intention of Trade Unions to press for short working hours has proved just as illusory. Lord Dukeston, a former president of the T.U.C. has admitted that the brief and excessive leisure bestowed on people must be given up. We are all parts of a very composite whole. No part can live and prosper unless all prosper and unless all play their part. The claims of organised labour to preferential treatment must be abandoned; the wage-earner must work as hard as his colleague on the staff. Until we become a united nation by working our way out of our present dire straits we can never know even a modicum of prosperity, nor can we maintain our present moderate standard of living. Some of us may have learned our lesson, but before we can put that learning to good use it will have to be appreciated equally by everyone in the country. Experience will teach us all.

There must always be a division of labour within the country. Some must work with their hands; others must work with their brains. Who does which of these things can depend only on the capacity of the individual. Yet another pretension of labour is that almost anyone can do the brain work. This belief is fostered by certain men who hold high positions in the Trade Union movement, together with the inevitable converse, namely that the well-to-do keep these positions a close preserve for themselves and their families. We draw special attention to a passage in the report of the General Council of the T.U.C. presented to the 79th Annual Conference which opened this week. In its evidence on education for commerce, the T.U.C. suggests reform of the methods of entry into professions: " It is commonly suggested that in many cases the supposedly qualifying examination is, in fact, used as a means of controlling entry to the profession. It may also be asked whether entry to these professions should be exclusively controlled by private institutions. We would suggest that the whole question of means of entry to these professions might well be the subject of further examination."

That is another of the pretensions of labour that should be exposed in all its hollowness. The Trade Unions are private institutions that control entry into trades. According to their claims during the past year, no one may be employed in certain work unless he is not only approved by the trade union concerned, but is a member of it. This closed shop idea should be opposed, attacked and eliminated. But inherent in the T.U.C. report is the suggestion that the " working man " cannot enter the professions because those already in those professions will not allow him to do so. May we not read into it also the next step, which is to claim that membership of a trade union should entitle a man to be admitted as an M.I.C.E., for example? Is it proposed that while the son of well-to-do parents must pass the examination of the Institution of Chemical Engineers, the lead-burner would be entitled to admission on the ground of his practical knowledge?

In all seriousness, it is perfectly true that qualifying examinations are used to control entry to all professions in the limited sense that in order to be acknowledged as belonging to the profession, a man or woman must prove the possession of adequate knowledge of, and training in, the art and science of that profession. Anything less than this would not only discredit the profession but prejudice the best interests of the nation. Few trade union leaders would care to work in a building constructed to the plan of a foreman bricklayer with no knowledge of the principles of architecture. There is only one way into any profession—the hard way. Any profession is open to anyone, whatever his station in life, so long as he possesses the necessary professional qualification. We hope to hear no more of this ridiculous proposal.

NOTES AND COMMENTS

German Industry

THE revised plan for the level of industry in the Anglo-American zones of Germany was published last week. This proposed increase in exports is to help make the zone pay for its own imports and take the burden from the shoulders of British and American taxpayers. The plan includes a big stepping up in the exports of chemicals—42 per cent over that of the plan of March 1946. If chemical production increases in accordance with the Anglo-American plan, much of the German chemical industry will be nearly equal to or exceed its 1936 output. On the whole it will be 98 per cent of that for 1936, but that figure is only 54 per cent of the existing capacity of the plants. It is proposed that basic chemicals which had a value of 270 million marks in 1936 shall be increased to 283 million with a producton just above that of 1936—a 38 per cent increase. Synthetic ammonia which is at its full capacity already has a value of 118 million and a production nearly a quarter more than that of 1936. Inorganic chemicals are to increase by 18 per cent to the 1936 output and will have a value of 180 million marks. These plants will be working at only three-quarters of their capacity. The largest group—miscellaneous chemicals (including explosives) will increase by 45 per cent nearly up to the 1936 figure, 1066 million marks compared with 1095 million. Although this is only slightly below the pre-war production level it is obviously well below (38 per cent) the existing capacity of the plant Organic chemicals up by 18 per cent will go to the 1936 figure—160 million marks, while dyestuffs although increasing by 50 per cent will be slightly lower in value at 173 million (1936—180 million), pharmaceuticals increasing by only 5 per cent will be 228 million (1936—270 million) and tar distillation up 97 per cent, lower at 63 million marks compared with 75 million in 1936. Chief rise in exports is to come, however, from the steel industry which is to increase by 135 per cent over the March 1946 plan. The cement industry too, is to increase by 43 per cent. No change is apparently being proposed in the arrangements made under the previous plan in regards to ball bearings, synthetic rubber, and synthetic petrol and oil

Dwindling Oil Resources

SOME interesting facts relating to world petroleum reserves and the possibility of large-scale production of oil fuel supplies by synthesis were disclosed by an American scientist, Dr. Kirtey F. Mather, when he addressed the British Association at Dundee last week. Speaking on " Petroleum today and tomorrow." Dr. Mather pointed out that petroleum was now being used at such a rate in relation to its total amount in the earth's crust that its complete exhaustion, from a geological viewpoint, was alarmingly imminent. It was probably a conservative estimate that the world's oil production would average more than 3,000,000,000 barrels a year during the next decade. Such figures he thought began to take on real significance when the most recent estimates made by competent petroleum geologists gave a figure slightly less than 70,000,000,000 barrels for proved world reserves. But it would be far too simple and quite erroneous to announce that the world's oil would be exhausted in 23 years, because the proved reserves were only a fraction of the actual reserves.

Although an intensive search for new oil-fields had been made in the United States and proved reserves were still increasing, there was little doubt, according to Dr. Mather, that the peak would be reached by 1950. Thereafter new finds would descend towards zero. This gloomy forecast was the inevitable stop for every oil-producing region in the world. Faced with the prospect of increasing demands and dwindling supplies, petroleum geologists, engineers, and economists must employ every weapon in the arsenal of science and technology to meet the situation.

Alternative Supplies

To help meet this, an appreciable fraction of American requirements was being met by the synthesis of liquid hydrocarbons from natural gas. Another alternative supply from abundant materials was oil from coal. If known techniques for producing oil from coal by chemical synthesis were applied to the coal reserves of Great Britain alone there would be sufficient petroleum for all British requirements for at least a few hundred years. As yet, however, Dr. Mather thought the equipment was far too costly and complicated for production on a sufficently large scale to permit a substitution of mineral fuel in the immediate future.

Not Good Enough

THESE are hard times for Britain, as indeed they are for most countries, hence our wholehearted acceptance of the principle of " exporting until we bust." Why then, is it, that the Industrial Wales Exhibition fails to impress? We should have thought that no effort ought to have been spared to attract buyers from all quarters of the globe.

Wales and Welshmen are known and liked the world over just as much for their native language and their quaint intoned rendering of English as for their Celtic customs of hard work and loyalty to a cause. The coalfields of Wales have been supplying coal to world markets for many decades—in fact until 1934, Wales was synonymous with coal. But in that year, Viscount Portal, then Sir Wyndham Portal, went there as an independent investigator to discover what could be done to relieve the industrial depression and consequent unemployment in the Principality. Following the publication of his report, great industrial developments took place. Tin-plate manufacture, oil refining, the production of chemicals and consumer goods for home and overseas quickly sprang into being, until the area assumed an importance comparable to that of the Midlands, the North-East and North-West.

At this stage of its development, therefore—austerity or no austerity, crisis or no crisis—careful and well-prepared plans should have been drawn up at least twelve months in advance. Publicity abroad might well have been intensified with Government backing through the medium of such bodies as the British Council. Guides and interpreters ought to have been promised, and such ordinary expressions of hospitality as hotel accommodation and social entertainment guaranteed at reasonable prices. Instead of the Board of Trade being a mere exhibitor it should have been a co-sponsor—or better still, the sole sponsor. There is, in fact, no excuse for ministries or government departments wasting taxpayers' money by exhibiting at a show which is to a large extent expected to attract buyers from overseas.

We think too, that for workmen to be seen putting finishing touches to stands on the day following the opening of an exhibition, is not the best way to create favourable impressions in visitors' minds. There can be no question of shortage of materials or of labour. This exhibition, and for that matter any exhibition at this period of British history, must be accorded priority rights. If British products exported abroad are to put this country first on a solvency basis, then on the road to a measure of prosperity, no obstacle must be allowed to stand in the way of success of such exhibitions as that of Industrial Wales. As it is, we fear there may be a distinct possibility of disappointing results.

Price Control of Fertilisers

The Board of Trade announces that under the Control of Fertilisers (No. 35) Order 1947, the charge which may be made for sulphate of ammonia and sulphate and muriate of potash, where delivery is in bags containing less than 2 cwt., is increased as from September 1, 1947, from 6s. 6d. per ton to 8s. per ton.

INDUSTRIAL WALES EXHIBITION

THE industrial capacity and prowess of Wales is strikingly portrayed at the Industrial Wales Exhibition which opened at Olympia on Thursday last. It is to remain open until Saturday, September 13, and visitors are admitted each day (except Sunday) between the hours of 11 a.m. and 9 p.m. Sponsored and organised by the Industrial Association of Wales and Monmouthshire, the exhibition may be regarded as the first major step the Association has taken to implement the 16-point pledge accepted at its inaugural meeting on April 11, 1947.

Following an official luncheon, at which Sir Gerald Bruce (the organisers' president) took the chair, the Rt. Hon. Viscount Portal performed the opening ceremony.

The chemical, chemical engineering and metallurgical industries are well represented by such firms as W. A. Baker & Co., Ltd.; British Celanese, Ltd.; British Nylon Spinners, Ltd.; British Gas Council; the Elephant Chemical Co., Ltd.; Guest Keen Baldwins Iron & Steel Co., Ltd.; Imperial Chemical Industries, Ltd.; Monsanto Chemicals, Ltd.; National Oil Refineries, Ltd.; and Patrol Polishes, Ltd., the Board of Trade, Ministry of Supply, and National Coal Board also have impressive stands.

On the occasion of our representative's first visit, he was not over-impressed by the attendance, though some firms reported they had received a number of important and optimistic inquiries both from home and overseas buyers. Certainly there is much to see and learn, and no doubt Pledge No. 2 of the Association—" To promote the goodwill of Welsh craftsmanship and to see that the industrial products of Wales find their rightful place in the markets of the world "—will be well on the way to realisation by the time the exhibition closes next week-end.

Meanwhile, and finally, a word of praise for the National Coal Board. Its working model of a pit-head, complete with screens, " tumbler," " shaker," conveyor belts and wagons, deserves full marks.

Canadian Paints

Sales of paints, varnishes and lacquers by manufacturers in Canada which normally account for 96 per cent of the total Canadian production, amounted to $6,706,917 in May, **compared with** $6,624,964 in April, and $5,945,465 in May, 1946, according to figures issued by the Dominion Bureau of Statistics. Sales for the five months ending May totalled $29,830,340 compared with $25,156,294 for the same period of 1946.

CHEMICAL EXPOSITION IN NEW YORK

IN an interview with our New York representative last week, E. K. Stevens, associate manager of the 21st Chemical Industries Exposition, which is scheduled to open in New York at the Grand Central Palace on December 1, told him that all available space has already been taken and that all quarters of the industry have shown widespread interest. The exhibition will offer a greater show of chemicals than ever before and, apart from the fact that there have been an increased number of inquiries for space, a greater number of former exhibitors have made application for more space than hitherto.

Processing Equipment

The display of processing equipment will be more comprehensive than usual, and it is expected that many new developments will be disclosed. Raw and fabricated materials, standard mill units, such as valves and piping, shafting pulleys, belts, clutches and couplings, transmissions, conveyors, motors, pumps, will be shown in great variety.

Chemical plant and chemical processes will be of interest to visitors from almost every branch of productive activity. The integration of chemistry is so widespread in industry to-day that equipment suitable for some part of almost every kind of manufacturing plant will be found in the list of exhibits. Against a background of machinery and manufacture, the Chemical Exposition, famed for its revelation of the latest products of research and development in the field of chemistry, will picture the remarkable progress of the past few years.

Among those who will form an advisory committee for the Exposition are: Raymond F. Bacon, consulting chemist; Wallace Cohoe, president of the Chemists' Club; J. V. N. Dorr, president of the Dorr Company; J. E. Ferris, president of the Salesmen's Association of the American Chemical Industry; George W. Heisse, president of the Electrochemical Society; W. Albert Noyes, president of the American Chemical Society; W. T. Read, General Staff, U.S. War Department; Charles M. A. Stine, president of the American Institute of Chemical Engineers; and E. R. Weidlein, director, Mellon Institute, Pittsburgh, Pa.

As in the past, only accredited visitors will be admitted to the Exposition, and sightseers and the general public will be excluded, thus ensuring better attention and more complete opportunities for members of the trade to study the exhibits and make their inquiries.

CEMENTS RESISTANT TO SEA WATER

Experiments by Italian Professor

INTERESTING experiments are being conducted at the University of Pisa in Italy by Professor Gino Gallo who is endeavouring to devise a formula for cements that would resist the deleterious action of sea water. It is a well-known fact that ordinary Portland cements disintegrate rapidly in sea water owing to the formation of small needle-like crystals of sulpho-aluminate of calcium which cause increase in bulk and the consequent cracks.

Professor Gallo has sought to overcome this trouble by replacing the oxide of calcium in cements by oxide of barium, as the sulphate of barium which would form in such a case is insoluble. His first experiments were conducted with three barium silicates: monobarium silicate (BSi), bi-barium silicate (B_2Si) and tri-barium silicate (B_3Si), which were made by mixing intimately pure silica and carbonate of barium. The materials were subjected to a temperature of 1500°C. in a Tamman furnace for about half an hour. The resulting product was ground finely and passed through a sieve of 4900 meshes per sq. c. The powder was next mixed with water and subjected to a setting test by means of a Vicat needle. The resulting samples were placed to mature in ordinary water and in water containing 1 per cent of sulphate of magnesium.

The results were as follows: (a) the monobarium silicate did not set at all; (b) the bi-barium silicate set in 30 minutes and developed heat. The samples immersed in ordinary water gave place to the phenomenon of hydrolysis and tended to disintegrate. On the other hand, the samples placed in 1 per cent solution of sulphate of magnesium formed a superficial stratum of sulphate of barium, preserved well, and displayed good resistance to pressure; (c) the tri-barium silicate set in 10 minutes, and developed considerable heat. The samples crumble in ordinary water, and preserve well in water containing sulphate of magnesium.

Professor Gallo next proceeded to test a mixture of 71 per cent tri-barium silicate, 7 per cent of bi-barium silicate and 22 per cent of tri-barium aluminate. This mixture set in 20 minutes and the samples not only resisted well in sulphated water but crumbled more slowly in ordinary water.

The last set of experiments was conducted with various mixtures of silica, alumina, oxide of iron and carbonate of barium, which are subjected to heating at 1500°C. for half an hour. One of such products composed of 76 per cent of tri-barium silicate (B_3Si) and 24 per cent of B_4Al gave excellent results. The setting started 40 minutes after mixing with water and lasted 1 hour 50 minutes. The samples behaved very well not only in sea water but also in fresh. Professor Gallo has kept some of them in ordinary water for over a year, and being protected by their thin stratum of carbonate of barium, they show no signs of crumbling.

Professor Gallo feels he is on the right track and it only remains for him to determine the quantity of barium oxide necessary for the protection of cement before achieving complete success.

OFFICIAL NOTICES

Magnesium Order Revoked

With effect from September 1, the Ministry of Supply has made an Order (The Control of Magnesium (No. 5) (Revocation) Order, 1947) revoking the Control of Magnesium (No. 4) Order, 1942. The acquisition, disposal, and use of all forms of magnesium and magnesium alloys has thereby been removed from licensing and price control. Supplies of magnesium will in future be distributed by F. A. Hughes & Co., Ltd., who will sell pure metal to all United Kingdom consumers without restriction at 1s. 2d. a pound delivered.

Control of Penicillin

Consequent upon the coming into effect of the Penicillin Act, 1947, on July 18, and the Therapeutic Substances Amendment Regulations, 1947, on August 18, the Ministry of Supply has made the Control of Penicillin (No. 3) (Revocation) Order, 1947 (S.R. & O. 1947, No. 1831). This Order, which became effective from August 30 last, frees penicillin and penicillin preparations from control by the Ministry of Supply. As from that date, licences granted under the Control of Penicillin (Nos. 1 and 2) Orders, 1946, have ceased to have effect.

While it is no longer necessary for firms wishing to manufacture penicillin preparations to obtain the approval of the Ministry of Supply to their acquisition of bulk penicillin, firms desiring to manufacture preparations for injection will need to apply to the Licensing Authority under the T.S.A. 1925 for a licence.

The effect of the Penicillin Act is that penicillin and its preparations may be supplied and administered to the public only on the prescription of a qualified medical practitioner, dentist or veterinary surgeon.

CHEMISTRY AND THE COLONIES*

by J. L. SIMONSEN, D.Sc., F.R.S.

OUR meeting can best be regarded as a continuation of that so abruptly terminated in 1939, and I appreciate greatly the honour of being asked to be the president of this section. Dundee early showed its interest in the British Association, and it is just 80 years ago since it first enjoyed the city's hospitality. On that occasion Professor Anderson was the president of this section. When next we met here, in 1912, Professor Senior gave a discourse on the nature and method of chemistry. Much of what he then said is true to-day.

Addresses from this chair have in the past concerned themselves with a variety of themes. Some have been devoted to a consideration of the more outstanding contributions to chemical knowledge during the previous twelve months, others to some branch of our science which the president has made more peculiarly his own, but, so far as I can discover, the application of the scientific method to the solution of the many problems of our Colonies has not so far been discussed. In attempting to do this I hope to interest a wider public than might be the case if I had chosen one of only scientific importance.

On this occasion the subject would appear to be particularly appropriate since just a year ago two important conferences were held in London, the Royal Society Empire Scientific Conference and the Official Commonwealth Scientific Conference. Many of the resolutions approved at these conferences, if they are, as we may hope, implemented cannot fail to influence profoundly not only the future of this country and the Dominions but also of our Colonies. Success can, however, only be achieved if there is the fullest co-operation not only in research but also in the utilisation of the results of such research.

Problems of the Empire

It may not be unfruitful to look for a short time into the past and to trace the beginnings of the application of science to the varied problems of the overseas Empire. To get a true picture we must bear in mind that many of the now self-governing members of the Commonwealth were at that time Crown Colonies and that within their territories there was little industrial development. They were regarded essentially as sources of raw materials for the mother country. Furthermore, it was not considered a function of government to engage or even support, except by small grants, scientific research. It was only during the First World War that governments first realised that their active participation was necessary, and this resulted in the formation of the Department of Scientific and Industrial Research. The work of this great organisation is too well known to require any elaboration by me. We have now parallel bodies in the great Dominions and in India.

An important landmark in the application of science to the colonies was the foundation in 1883 of the Imperial Institute, a national memorial to the jubilee of Queen Victoria. In the first issue of the *Bulletin* of the Institute (May 1, 1903), the functions of the Institute were stated to be: "The principal object of the Institute is to promote the utilisation of the commercial and industrial resources of the Empire by arranging comprehensive exhibitions of material products, especially of India and the Colonies, and providing for the collection and dissemination of scientific technical and commercial information relating thereto."

Imperial Institute Studies

I do not propose to give a detailed account of the work of the Institute or of its vicissitudes. It will suffice to record that the necessity for research on colonial products was fully recognised by its first Director, the late Sir Frederick Abel and by his successor, Sir Wyndham Dunstan. Laboratories were provided and much original research was carried out in them, while the collaboration of other investigators was obtained. I would mention in particular the valuable studies on the natural colouring matters which we owe to the late Professor A. G. Perkin, whose materials were largely supplied by the Institute. Possibly the most valuable of the earlier activities of the Institute was the organisation of geological surveys in the African colonies and the assistance which it gave to the growing of cotton in the Empire. Unfortunately, the work of the Institute has always been handicapped by the lack of adequate financial resources and in recent years original research has no longer formed a part of its activities. It has, however, continued to be a main centre for the collection and dissemination of scientific, technical and commercial information. The great importance for such a centre was emphasised at the meetings of the Royal Society Conference, and this subject, as you are doubtless aware, received strong support from this Association. It is obvious that whatever form the reorganisation of the Institute may take in the future, this activity is likely to prove of increasing importance.

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* Presidential Address to the Chemistry Section of the British Association for the Advancement of Science at the Dundee meeting.

It has during recent years become clear that if the Colonies are to be developed and play their full part in the world's economy, they can no longer continue to be regarded solely as prime producers. While it is recognised that agriculture, with its essential feature the growing of foodstuffs, must continue to be the main industry of the Colonies, as indeed is true also for many of the Dominions, the introduction of other industries is essential. While the development of these in their early stages is dependent mainly upon the application of known processes, their future progress will require research of a high order, and this is especially true of agriculture, which must be highly efficient, since it is not improbable that this will provide the main source of their industrial raw materials.

Colonial Products Research Council

In spite of the major preoccupations of war the government in this country gave careful consideration to these colonial problems, and they rightly reached the conclusion that only with the assistance of science and the men of science could they be solved. In 1942 the Colonial Products Research Council was formed, and it held its first meeting in January, 1943. It may not be without interest to record here a part of its terms of reference:

"To review the field of Colonial production and to advisé what colonial raw materials are likely to be of value to the manufacture of intermediate and other products required by industry; in consultation with the Director, to initiate and supervise researches, both pure and applied, on such products, and generally to consider how, by the application of research, greater use can be made of them."

While the term "raw materials" in the terms of reference, if interpreted in its full sense, includes minerals, animal and vegetable products, I propose to confine my remarks more especially to the last, since a consideration of the first two subjects would take me into fields of science upon which I do not feel competent to address you. With regard to minerals it will suffice to say that in the future economy of many of the colonies they are likely to play a predominant part. Much now depends upon a detailed geological survey, still so sadly lacking, and so far as the African Colonies are concerned upon the full utilisation of the admirable facilities available in the Union of South Africa for experiments on their processing.

As raw materials for the chemical industry plant products can be of two kinds, primary products such as sucrose (sugar), vegetable and essential oils, or secondary (waste) products, bagasse, straw, shells of nuts. We must for the provision of these depend upon two important factors, water and an efficient system of agriculture. Perhaps, not unnaturally, we in this country are not sufficiently water-minded, but we must recollect that the Colonies are in the greater part situated in the tropics. In many of them water is not too abundant and a systematic survey is required, not only of its availability for irrigation but also as a source of hydroelectric power. I would suggest also that it might prove profitable to study in how far some of the saline water from inland lakes could be rendered suitable for irrigation by the use of resin filters.

In making a survey of the plant products of the Colonial Empire it is at once apparent that the most abundant of these are the carbohydrates, starch and sugar. Any large scale chemical industry based upon plant products must look to these for their basic raw materials. Starch already finds an extended application in industry and it differs considerably in its properties depending upon its source. New uses are also likely to be developed. The elegant methods evolved in the Birmingham laboratories for the separation of the two constituents, amylose and amylo-pectin, have rendered these readily accessible products. Amylose resembles cellulose closely in its properties and could doubtless for many purposes replace this. We know very little of the nature of the starches present in the starch-producing plants of the tropics, and a survey of them is urgently required. Preliminary investigations in this direction are in progress, but in view of the importance of the subject they need to be considerably extended. The work is tedious and it can be carried out only in the territories where the plants occur. We cannot assume that other starches with properties as unique as those of arrowroot will not be found.

Sucrose

When we turn to sucrose we find that in the past, apart from its use as a foodstuff, its industrial application has been confined almost solely to the fermentation industries. In addition to its utilisation for manufacture of alcoholic beverages, industrial alcohol and other solvents, it is now a source of many important acids. Much consideration has been given to the possibility of using carbohydrates for the manufacture of power alcohol or similar products for use in internal combustion engines. This may prove possible to a very limited extent, but the cost of power from such materials would be prohibitive and the area required for the cultivation of the necessary plant products could ill be spared from that required for the growing of foodstuffs. Here, in parenthesis, I would mention that, should the cost of molasses rise too greatly, it is doubtful if they can compete as a source of alcohol with ethylene from the gases resulting from the cracking of petroleum. This is especially true since the methods for the manufacture of alcohol and other chemicals from ethylene and also from acetylene have been greatly improved.

Enormous Production

It is somewhat remarkable that although sucrose is the organic chemical produced in a pure state on the largest scale of any in the world, until recent years very little attention has been directed to the possibility of utilising it as a raw material for the chemical industry. Active work with this object in view is now in progress both in this country and in the United States. We are fortunate that for many years this country has led the world in the study of the chemistry of the carbohydrates and, taking advantage of this, the Colonial Products Research Council has, since 1943, had a team working at Birmingham on this fundamental problem under the direction of Professor Sir Norman Haworth and Dr. L. F. Wiggins. The sucrose molecule is complex and we do not expect rapid or spectacular results, but some progress has been made. In one derivative of sucrose, levulinic acid, we have a substance which in the form of its sodium salt is an excellent antifreeze, superior in many respects to ethylene glycol. From this acid also compounds have been prepared which show promising chemotherapeutic properties. Other derivatives of sucrose may find application in the plastics industry. The processes required for the prepartion of some of these substances are comparatively simple and could be carried out readily in the territories in which the sugar cane is cultivated. This would undoubtedly cheapen their manufacture since research has shown that in many cases the crude cane juice can be used in place of the crystallised sucrose. We may anticipate that in a few years sugar will once more be produced in quantities far in excess of that required for nutritional purposes, and by that time our knowledge of the new developments referred to above, and probably others, will be sufficiently advanced to enable them to be developed on an industrial scale.

I do not propose to bore you with an account of the other investigations which are being carried out on Colonial products but there is one activity of the Colonial Products Research Council to which I must refer. During the course of a short visit which Sir Robert Robinson and I made to the Caribbean in 1944 we were impressed by the important part which microbiology might play in the development of the economy of the West Indies and also of the other Colonies situated in the tropics. Microbiology has, in this country, been a Cinderella among the sciences, and its importance has only come to be fully recognised with the discovery of penicillin and the other valuable antibiotics now being studied so vigorously. Facilities both for the training of microbiologists and for research in this subject are in this country somewhat limited. With the recognition of its importance to the Colonies the Colonial Products Research Council decided to open a Microbiological Research Institute in Trinidad. This will, I believe, be the first research institute in the British Commonwealth dealing solely with the subject, and it will have as its first director Dr. A. C. Thaysen, whose work in this field is well known. As chemists we are accustomed to associate this science mainly with the fermentation industries, but the flavour of our tea, cocoa and tobacco is dependent largely also upon the action of microflora. It is possible also that the fusarium, responsible for the Panama disease which attacks the banana, may be open to biological control. An actinomycete, first isolated in the West Indies, has been found to destroy this fusarium, and it is now being actively studied from both the biological and chemical aspects jointly by Dr. Thaysen and by Dr. A. H. Cook and his collaborators in Sir Ian Heilbron's laboratory.

Soil Fertility

We can anticipate also that this Institute may be able to assist in the solution of some of the difficult problems associated with soil fertility. Recent research is providing evidence that the polysaccharides, resulting from the action of the soil microflora, play an important part in the formation of the soil humus. Is it too optimistic to anticipate that this joint biological and chemical attack on the conditions present in the soil may provide new methods for the prevention of the impoverishment of the soils so widespread in the Colonies? It is intended that this research institute shall be a centre for microbiological research not only for the Colonies but for the Commonwealth as a whole.

During the course of our survey of the colonial plant products our attention was not unnaturally directed to the very large number of plants to which medicinal properties have been attributed. In some cases the reputed action of the plant is religious in its origin, in others such action as they may have, is due to the presence of tannins or mineral salts, but there remain many which require further investigation. Synthetic organic chemistry, with its attention to chemotherapy, has replaced many drugs previously obtained from plants. I need only mention the antimalarials, more especially paludrine. This new drug, probably the greatest contribution of British chemistry in the field of chemotherapy and one which may revolutionise life in the tropics, is due to Dr. F. H. S. Curd and Dr. F. L. Rose and their collaborators working in the pharmaceutical laboratories of Imperial Chemical Industries, Ltd. In my opinion the special merit of their achievement is that they have broken away from tradition. Unlike previous synthetic antimalarials, paludrine has no structural resemblance to quinine. It would appear to be highly improbable that quinine can any longer be regarded as the drug of choice in the treatment of malaria. Such progress does not, however, in my opinion, diminish the necessity for a further study of the constituents of the plants with which medicinal properties have been associated. The application of the modern technique to this problem should make it a fruitful field of research both for the chemist and the pharmacologist. Investigations of this character will not only be of interest to the structural organic chemist but may be of assistance also to the taxonomist.

Oils from Grasses

My attention was first directed to the latter possibility during my investigations on the constituents of the essential oils derived from the cymbopogons. These grasses are difficult for the systematic botanist to identify although they can be readily differentiated by the constituents of their essential oils. For example, the two grasses, *Cymbopogon Martinii* Stapf (var. *motia*) yielding palmarosa oil is indistinguishable in the herbarium from *C.Martinii* Stapf (var. *sofia*), which yields a ginger grass oil of little value. Since the two oils have very different constituents they can, however, be readily characterised in the laboratory.

Some years ago I ventured to suggest that comparative chemistry might be used to assist the taxonomist, and this possibility has been discussed in two sectional presidential addresses to this Association. In 1929, Barger expressed the view that chemistry was likely to be of little value to the systematic botanist. He recognised that it had proved of use in the classification of the lichens and of the eucalypts, but he was unable to trace any connection between chemical structure and botanical classification in the case of the alkaloids. The subject of chemical constituents and taxonomy was considered in much greater detail by Hill in 1930 at the Bristol meeting of the botanical section. He recorded many instances where comparative chemistry had been of great assistance to the systematic botanist. In spite of the respect which I have for any opinion expressed by so great an authority as Barger, my own view is unchanged. The investigations of British chemists have in the past made great contributions in this field. We have the classical work of Baker and Smith, so ably continued by Penfold on the eucalypts. They have traced a relationship between the venation of the leaves and the constituents of their essential oils. A determination of the latter enabled them to define the species, and their classification of the eucalypts is essentially one based upon chemistry. Even wider in its scope has been the work of Sir Robert and Lady Robinson on the anthocyanins. The elegant and delicate methods of analysis which they have developed has made their work not only of value to the systematist but also to the geneticist, and I do not doubt that with a return to normal times we shall see it utilised to a much greater extent. Finally, I would refer to Hilditch's researches on the constitution of the glycerides in the animal and vegetable oils and fats. My views have received strong support in a recent publication by Darnley Gibbs. He has provided conclusive evidence that the botanist can no longer disregard the nature of the chemical constituents in his classification of plants. If, however, chemistry is to be in a position to afford this assistance, a refinement and simplification of our methods of analysis is necessary. The possibility of this is well illustrated by the work of the Robinsons.

The chemist cannot only be of assistance to the botanist but also to the zoologist. Already Ford has shown that in the case of butterflies the classification based upon morphology corresponds with the chemical character of their pigments while Munro Fox has shown that the difference in their hæmoglobins can be used to differentiate the several species of the crustacean genus daphnia. I would direct attention also to the important results obtained recently by Erdtmann in his detailed study of the constituents present in the wood of conifers and in pine needles. From these he has isolated substances showing marked fungicidal properties. We may well inquire if these are natural timber preservatives. Erdtmann has further found that many geraniol derivatives act as fungicides. We shall look forward with interest to the continuation of this work.

Colonial Flora

I would suggest that considerations of this character would alone warrant a detailed study of the rich flora of our Colonies even if we do not thereby find new products of economic value. But one further and no less important branch of research may profit from a more detailed study of plant constituents. We are still in the main ignorant of the part which they play in the plant metabolism. We have, it is true, some knowledge regarding the carbohydrates and fats but little definite information regarding the essential oils and alkaloids, although Robinson's theory as to the mechanism of the formation of the latter is undoubtedly correct. It is possible that a successful attack on problems of this nature may now prove possible by the use of isotopes. Only when we are fully cognisant of the part which the plant constituents play in the plant economy can agriculture be placed upon a really sound scientific basis.

In concluding this brief and, I fear, somewhat disconnected survey of some of the many problems relating to the application of science to the Colonies, I must refer to one aspect of primary importance, and one upon which its success must in large measure depend, namely, the health and well-being of the peoples. It is but a platitude to say that the health of a people depends upon an adequate supply of nutritious food and upon the prevention of disease. Both are dependent upon science and in neither respect can the conditions in the Colonies be viewed with complacence. Chemistry can play a major part in their improvement but only if it is used on an adequate scale, as our experience during the war has shown. Our scientific efforts should, in my opinion, be applied first to these fields.

Foodstuff Loss

If we are to have an adequate supply of food, it is, of course, obvious that we must have an efficient system of agriculture, but this will be of little gain if, after the crops are harvested, we lose much of them by pest infestation. It has in the past been too little realised how great is the loss of foodstuffs by insect, fungoid and rodent attack. It is estimated that, of the annual crops of cereals, oil seeds, beans, etc., some thirty million tons a year are lost in this way or, in other words, there is an average total loss of some 3 to 5 per cent of the world's food production. The loss naturally varies in different countries, in Canada it is about 1 per cent, but in Kenya the loss of maize may be as much as 10 per cent and in East Africa about one-third of the total production is lost in this way. These figures suggest that improved methods of agriculture together with the prevention of soil erosion will have little effect if we do not at the same time prevent this loss. Fortunately, we are acquainted with methods which can do much to mitigate it if they are scientifically applied. We can reduce the moisture content of grains before they are stored, we can see that adequate storage accommodation is available, we can see that it is free from insect infestation prior to storage and inaccessible to rodents.

Deinfestation

Deinfestation before storage can be effected with various chemicals, but unfortunately many of these are also toxic both to man and animals. In some cases, for example hydrogen cyanide and methyl bromide, the toxicity is very high, but we know how to overcome any risks which may be attached to their use. The toxicity of the newer and most valuable insecticides, gammexane and DDT is apparently very low and it is doubtful if they involve any danger to man in the quantities usually employed. Unfortunately accurate knowledge on this point is still lacking and it will require long term experiments to determine whether they can act as cumulative poisons. Until such evidence is available it is obvious that their use in direct contact with foodstuffs cannot be permitted. This may appear to be an ultra-cautious attitude to adopt, but the recent work of Mellanby on the cause of dog hysteria justifies it. It is disturbing to find that this is caused by the ingestion of flour bleached by a well known and widely used method. Dare we assume in the absence of similar evidence that the continued consumption of small quantities of these new insecticides may not expose us to danger? If on further investigation these insecticides are found to be safe and non-toxic we shall have a weapon which should largely prevent loss of foodstuffs by insect attack.

Control of Disease

Of even greater importance than the prevention of the loss of food is the control of insect-borne diseases of man and beast which so seriously undermine their health and which render large areas of the Colonies uninhabitable. The field operations in Burma and elsewhere have proved conclusively that a large measure of control is possible, and it is doubtful otherwise if the campaigns in these tropical areas could have been fought with success. Our two foremost enemies are undoubtedly the mosquito and tsetse fly. Since Sir Ronald Ross' epoch-making discovery that the mosquito was responsible for the transmission of malaria and the subsequent proof that it was responsible also for yellow fever, large-scale measures for its control have been successfully undertaken. These measures cannot, however, be generally applied, and I believe that a new era has now arrived by the discovery of the new synthetic insecticides. Admittedly we have still much to learn as to their method of application but the experiments carried out during the war and since its termination have given results of the greatest promise. I would venture to suggest that we have already sufficient knowledge to enable us to eradicate the mosquito from isolated areas. If applied on an adequate scale it should prove possible by their use to eliminate completely the mosquito from islands, such as Cyprus, Trinidad and Mauritius, without in any way affecting the beneficent insects. The financial cost would be comparatively small and negligible compared with the gain in health and efficiency of the inhabitants. The control in Continental areas affords greater difficulty, but the results obtained by Symes and his co-workers in British Guiana and Uganda have already indicated that the problem is not insoluble. In spite of certain views to the contrary, it seems to be proved that the internal and external spraying of the houses in towns and villages with suitable solutions of the insecticides, owing to their lethal and residual effect, does result in a pronounced fall in the mosquito count and this must inevitably result in a diminution in the risk of infection. It should not be forgotten that at the same time other transmitters of disease, flies and lice, will also be killed. It is essential that the various problems involved in the use of these insecticides should be vigorously attacked in a bold and imaginative manner. Simultaneously we should not overlook the possibilities of the prophylactic and curative uses of paludrine and other medicinals and of the insect repellants such as dimethyl phthalate. If the co-ordinated attack on malaria, which is now possible, meets with success, which I believe it will, life in the tropics will be revolutionised, and science will have made another notable contribution to colonial prosperity.

Tsetse Fly Control

A problem of far greater complexity is involved in attempting the control of the tsetse fly, the transmitter of trypanosomiasis. While we know that a partial measure of control does result from a clearing of the bush the method is far too laborious and expensive to be applied over the vast areas which are involved. We know also that the fly can be killed by insecticides if brought into contact with them, but we do not know how this can best be done. The evidence at present available suggests that a solution may be found in insecticidal smokes applied either directly from aeroplanes or by smoke bombs dropped from them, but much further research is required. We must be prepared to attack this problem on a scale commensurate with its magnitude and the cost will be heavy. We should be encouraged to undertake this, however, when we see the success achieved against that major agricultural pest, the locust, by the combined use of gammexane baits and dinitro-*o*-cresol.

I have attempted most inadequately to show the part which science can play in the development of our Colonies and in the improvement of the health and prosperity of their people. For the man of science the opportunities are great, equally great are his responsibilities. He will not fail if he receives from the administration the support to which he is entitled.

Notes from Brazil

THE Conselho Nacional de Petroleo, Rio de Janeiro, announces the discovery of a new oilfield at Dom Joao, in the Sao Francisco do Conde area of the State of Bahia. Results so far obtained in that locality are considered excellent, the first two wells drilled being reported to have respective daily outputs of 300 and 700 barrels.

Tenders have been received by the Conselho from several U.S. concerns for the erection of a refinery in the State of Bahia, with a daily capacity of 2500 barrels, to process local crude oil. A Bill is now before Brazil's Congress proposing that this refinery should be operated by an organisation to be styled Refinaria Nacional de Petroleo A.A. with a capital of 50 million Cr., one-half to be subscribed by the Government and the remainder by the public.

Bottled Gas

The Companhia Nacional de Gas Esso, a subsidiary of the Standard Oil Company, was recently formed for the purpose of distributing bottled gas throughout Brazil. A report from New York stated that the first shipment, consisting of 100,000 gallons of propane gas, is now en route to Rio de Janeiro. A similar product, imported from Argentina, has been marketed in Brazil since 1937 by the Cia. Ultragaz S.A. for domestic and industrial purposes.

Scientific and Technical Research in Japan

Approximately two-thirds of the 3951 research projects undertaken in Japan during the last six months were in the field of applied science, the remainder being in fundamental science (excluding work in medical schools and hospitals), states Report No. 19, issued by the Supreme Commander for the Allied Powers. Most of the 180 laboratories engaged in applied science were commercial, Government-operated, or independent laboratories not connected with the Universities. Chemical technology, with 35 per cent of all projects in applied science, was the largest single field of endeavour; it was followed by agriculture and forestry, electrical technology, mechanical technology and metallurgy. Shortage of equipment and materials, however, seriously hampered research work and kept its general quality fairly low. Emergency problems of short-range importance, such as saccharification and salt production, received much attention and special emphasis was also placed on research for new sources of food and on substitutes for soap-making ingredients.

Metallurgical Section

Published the first Saturday in the month

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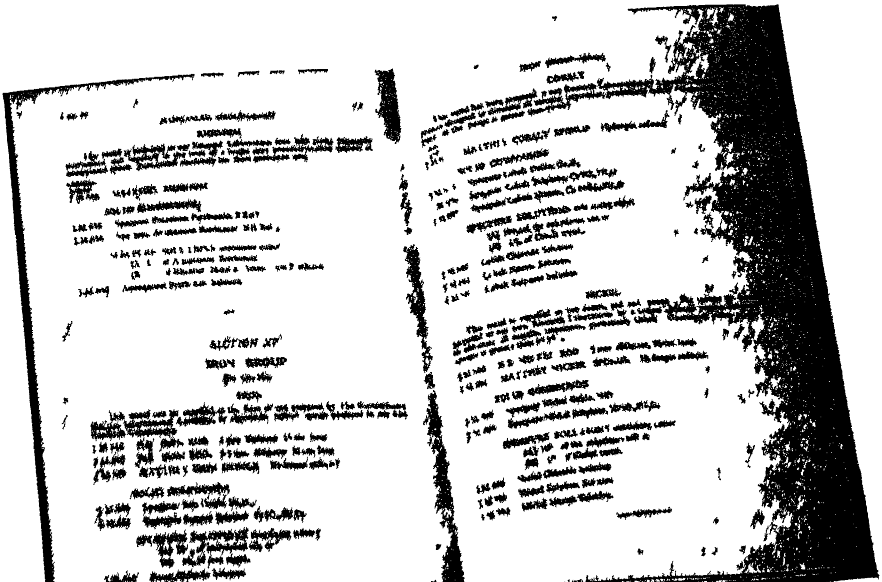

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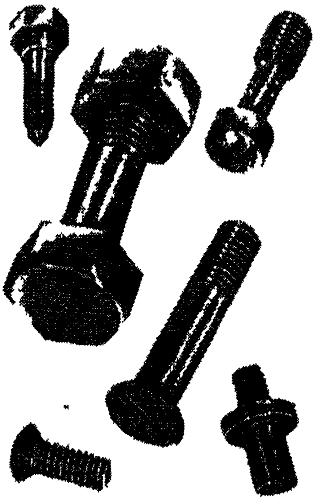

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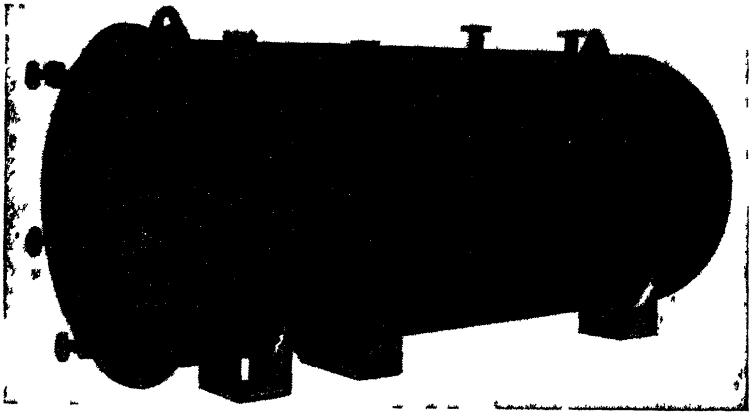


Illustration shews M.S. Rubber Lined Tank for Hydrochloric Acid

TANKS. CYLINDRICAL AND RECTANGULAR
PUMPS AND FLOW METERS, ETC.

Metallurgical Section

6 September 1947

ELECTROLYTIC LEAD FOR RESEARCH PURPOSES

by A. G. AREND

THOSE desirous of keeping up-to-date with modern industrial conditions will be aware of the continued encroachment of electrolytically refined metals on those which formerly were prepared by smelting methods. This applies alike to copper, nickel, tin, and to a lesser extent to zinc. On the one hand, almost perfectly pure metal is obtained in each case with the most favourable physical characteristics for fabricating or alloying purposes, or for electrical uses, while alternatively, all associated rarer constituents are simultaneously recovered. Until the closing stages of the recent war, lead differed in these respects, as the moderately pure metal sufficed for all normal purposes, ranging from plumbing and chemical constructional work to cable sheathing, and fine packaging, etc. The fact that this metal could be rolled out to thin foil was no indication that it was perfectly pure, but simply that it was free from excessive impurities. Lead is so readily obtained by direct smelting methods in blast-furnaces, that even to this day, the majority of it hails from this source. Refining methods in earlier years more related to skimming practice, and application of the Parkes and Pattinson processes for separating silver, etc.

Ever-increasing Demands

Electrolysis opened up a fresh field in that all associated impurities could be recovered from the anode slimes, but earlier applications did not enjoy popularity, as there was no great demand for pure lead, and further they were fraught with many practical difficulties. To-day, events alike in nuclear researches, and radiology, reveal only too clearly that perfectly pure electrolytic lead has become ever-increasingly in demand. Details of how lead screens are engaged in atomic energy pursuits, and of "X"-ray rooms which are completely lined with sheet lead, let alone those constructed of lead-clad plywood to provide other barriers and shields, require little in the way of advertisement, as they are fully known to all scientific investigators. Interest in perfectly pure lead, as distinct from ordinary electrolytically refined lead, has thus become correspondingly greater. Although the same remarks apply to cadmium, beryllium, and indium, this relates to specialised uses, whereas pure lead can be turned to account for a wider range of applications. A perusal of recent literature on nuclear researches will reveal how difficulties were encountered in acquiring pure graphite, heavy water, and other commodities, all of which are made by exacting electrolytic practice. Lead did not give complications in the same way, since repeated treatment could produce it with total impurities of less than 0.0006 per cent.

Initial Electrolytic Refining

The production of this lead involves both large-scale electrolysis to provide first a metal which contains little more than 0.008 per cent of total impurities, and then smaller scale electrolysis to produce sheets of the perfectly pure metal. The reason why electrolytic refining of scrap lead has not been persevered with is that the original metal had already been desilverised, while most bismuth, and any other constituent of value had been removed.

It is thus a better paying proposition to start with crude lead as delivered from the blast-furnace, and have this cast as anodes and electrolysed. This procedure enacts the dual operation of refining and accumulating most impurities in the anode sludge, or leaving them in the electrolyte. Where the lead is too impure, it is subjected to skimming treatments as a preliminary, and to ensure smooth uniform deposits, should be about 97 per cent pure. The conditions of the electrolysis require careful control to acquire the highest current efficiency, which should never fall below 90 per cent, and with good working can be much higher. Asphalt-lined wooden tanks are used, but are set-up in different systems, as the cascade arrangement with double rows of 5, 6, and 11 tanks has a competitor in an alternative system of 4 tanks in a row, which provides considerable economy in bus-bar copper. This is because copper triangle bars of small cross-section conduct current from the cross-rods of the cathodes of one tank to the anodes of a neighbouring tank, while it is only at the ends of the sections that bus-bars are used.

A gravity feed tank distributes the electrolyte to the tanks, which liquor is later returned by a system of centrifugal pumps, suitably lined to minimise corrosion. This circulation causes the liquor to flow at the rate of from 2½ to 4 gallons per minute through each tank, while a temperature of approximately 40° C. is maintained.

Whereas a multiplicity of electrolytic compositions have been proposed for lead refining, and have appeared in patent literature, only fluosilicate solutions are used at the first stage, although ultimately, an alternative electrolyte is necessary for depositing the perfectly pure metal.

Preparation of this fluosilicate is done in an adjoining plant where a mixture in the ratio of 2½ lb. fluorspar and 3 lb. sulphuric acid (66° Be.) is distilled to give hydrofluoric acid, which is then run through selected silica sand. (Since the war ended, fresh compositions of silica-free glass have made it possible to conduct this entire operation in glass containers). Before commencing the electrolysis, part of this liquor is converted to lead fluosilicate in small cells using lead anodes and cathodes, separated by a diaphragm, and which require some 1.25 volts per cell. The liquor so obtained is then pumped into the electrolysis tank proper, where it is maintained so as to contain 8 per cent free hydrofluosilicic acid, and approximately 6 per cent lead. Cast anodes of some 4 cwt. are used with dimensions of 2 ft. by 3 ft., and about 1¼ in. thick, and the electrolysis is continued until these have been reduced to a mere skin. The cathodes are simply thin sheets of pure lead, slightly larger in size than the anodes, and which are made by pouring the molten metal over inclined cast-iron plates.

The anodes and cathodes are arranged in the tanks at a spacing of between 4 and 5 in. Current is applied at 16 amps per sq. ft. of cathode surface, while from 18 to 21 lb. of lead, depending on the resistance set-up and the current efficiency, is deposited per kilowatt-hour.

Conversion to Highest Quality Lead

In actual practice, the conditions are varied from time to time according to the crystalline tendencies of the deposit, and no one set of conditions will suffice. For example, slower deposition by using only 9 amps per sq. ft., with an electrolyte of 11.5 per cent free hydrofluosilicic acid, and 8.3 per cent lead, is resorted to for ensuring a good coherent deposit. The addition of a minute proportion of gelatine to the extent of 0.01 per cent, improves this deposition. By dint of appropriately manipulating the conditions, it has been possible to attain a cathodic current efficiency of 98 per cent. With good working, discard left from the anodes should not exceed 18 per cent, while total corrosion should not require more than 4 days. Lead so obtained contains little more than 0.008 per cent of impurities, and thus suffices for all ordinary industrial purposes, but for the more exacting nuclear and " X "-ray activities which have developed so widely, this is insufficiently pure. In detail, the impurities are made up of 0.003 per cent each of bismuth and antimony, 0.0008 per cent iron, 0.0007 per cent zinc, and 0.0003 per cent copper, while silver varies around 0.0004 and 0.0006 per cent. The conversion of this product to pure metal would not be commercially economical for ordinary purposes, as the electrolysis has to be repeated. By so doing, however, it is possible entirely to eliminate antimony and silver, and reduce the others to negligible proportions. The total impurities are thus brought down to some 6 parts per million of lead, half of which is represented by iron, and the remainder sub-divided between bismuth, copper, and zinc.

Sheets for Anodes and Cathodes

Unlike the large electrolysis baths engaged in the foregoing work, the process is now carried out on a more or less laboratory scale, with anodes of small weight, giving a total product of from 20 to 80 lb. per run. The lead obtained by the first electrolysis is initially rolled out in thin sheets alike for anodes and cathodes, although it has sometimes been necessary to melt it, to get rid of small inclusions and gas pockets, prior to rolling. The anodes are cut off from the rolled sheet in sizes of 1½ ft. by 1 ft., at thicknesses of little more than one-tenth of an inch, although more rigidity can, of course, be ensured by using greater thickness. Instead of preparing lead fluosilicate and free hydrofluosilicic acid chemically, as in the former instance, perchloric acid, and perchlorate of lead are prepared independently in a small electrolysis vat. This is done between platinum-lined electrodes, commencing with sodium chlorate as the raw material. The process follows the method originally outlined by F. C. Mathers, but which although operating with electrolytes of greater stability, and higher conductivity then the fluosilicate solutions, could not compete with these, and was thus limited to smaller demands for perfectly pure lead. The tanks are arranged on the same lines as the large-scale process, with a continuous flow of the electrolyte, and an overhead storage tank which feeds them. A small centrifugal pump, operated at fixed intervals by a mercury switch actuated by a ball-float mechanism maintains the level of this storage tank. The liquor is caused to pass through a filter-press continuously

(*Continued on page* 332)

IRON, THE KEY TO AUSTRIA'S PROSPERITY*

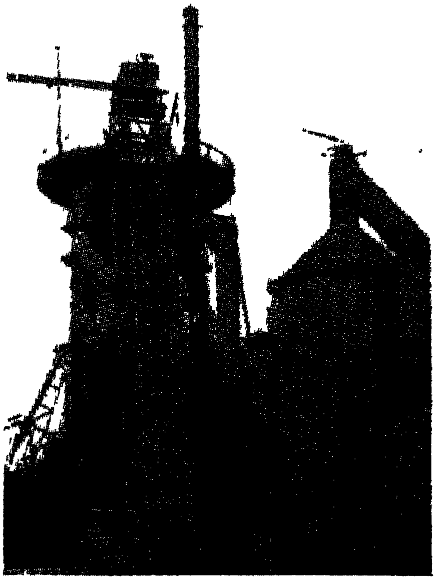
Iron and Steel Production Reviewed

THERE are few single industrial plants in Europe which bear such a vital relation to the fortunes of the country in which they are located as does the Donawitz Iron and Steel Works in Austria. The little town of Donawitz which houses the main plant of the great "Alpine Montangesellschaft," lies in Northern Styria (British zone) north of Leoben, in beautiful natural surroundings.

Importance to Austrian Economy

The works has four blast furnaces, fourteen open-hearth and three electric steel furnaces, with a capacity of some 450,000 tons of crude steel a year, and rolling mills capable of dealing with practically the whole of its steel output. The significance of its capacity to the Austrian economy will be appreciated by the fact that, in 1937, the country as a whole produced only 650,000 tons of crude steel and about 450,000 tons of rolled steel. Donawitz and the nearby sister plant at Eisenerz produced between them the whole of Austria's pig iron output (some 390,000 tons) which fed the steel furnaces not only of Donawitz but of all other Austrian steel works and iron foundries, and in addition provided an export surplus which in 1937 was as high as 54,000 tons. Donawitz alone produced considerably more steel than Austria could consume and together with Böhlers, Schöller Bleckmann and other producers, contributed about 14 per cent of the value of Austria's visible export trade. The ore for Donawitz is mined and brought by train from the nearby ore mountain at Eisenerz which has a rather terrifying grandeur which emphasises its natural riches and tremendous industrial value. The ore mountain, which rises to a height of 2725 ft., has been hewn into over sixty terraces each about 40 ft. high and gives the general impression of a pyramid in the process of construction. The treasure it contains amounts to some 230 million tons of iron ore which although mainly obtained by surface excavation, is also mined below ground, thus enabling production to be continued in all weathers. The average iron content is 30 per cent, a figure which is raised to over 44 per cent by roasting the ore in the neighbourhood of the workings before despatching it to the blast furnaces. Because of its low sulphur and phosphorus content this ore is comparable with the best iron ore of Sweden.

At Donawitz the ore is charged into the blast furnaces together with coke, which is either imported into Austria or made from imported coal at the new coke ovens in Linz. The molten pig iron is taken straight to the open hearth steel works for refining with an admixture of scrap. The refined steel ingots are allowed to cool to the correct heat for rolling before being rolled to different shapes and sizes. The principal products of Donawitz are blooms, billets and sheet bars (for rolling and finishing in the company's subsidiary plants at Kindberg, Zeltweg, Neuberg and Krieglach), bars and sections of all kinds, reinforcing rods, wire rods, heavy plates, girders, and rails. Most of the steel is open-hearth grade and can hold its own with the open-hearth steel of any country.



Blast furnace at Donawitz, showing hoist for ore and coke

Post-War Difficulties

During the early months of the Allied occupation, among other things, Donawitz suffered the removal of its modern electrically-driven blooming mill (through which all the steel ingots had to pass in the first stage of rolling), some of the electric steel furnaces, a large gantry crane, and a sintering plant necessary for the treatment of fine ores before they were charged into the blast furnaces. These losses, particularly that of the blooming mill, would have had a crippling effect, had not production in any case been restricted by lack of coke. However, a sixty-year-old steam-driven cogging mill was brought back from retirement, repaired with the help of Böhlers of Kapfenberg, and placed in position. A new crane was obtained from Wiener Brückenbau In the meantime, based on reserves of cold pig iron and scrap, steel production continued on a limited scale. The old cogging mill was ready for service by the beginning of 1946, and increased steel production now became possible, although the reserves of pig iron were not unlimited.

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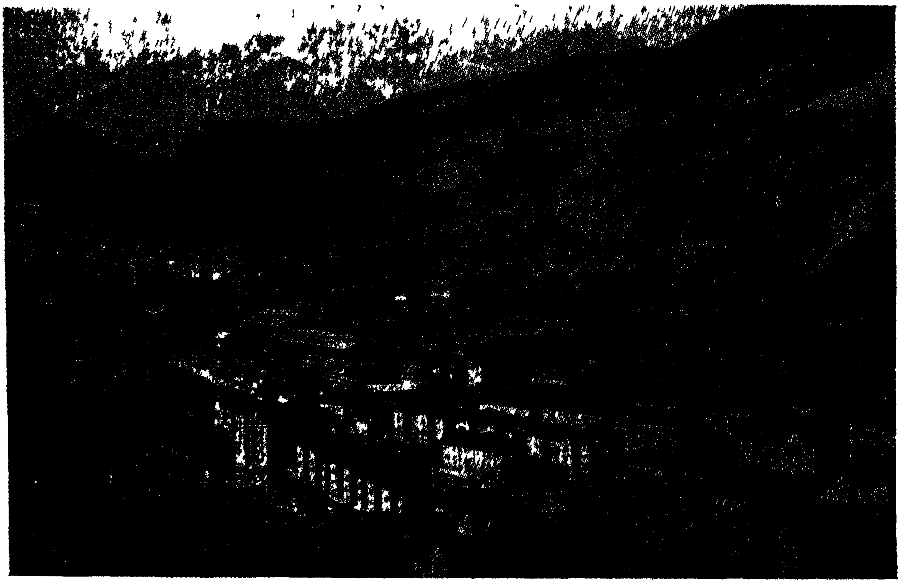
* Condensed from a Report issued by the Allied Commission for Austria.

In the absence of molten pig iron supplies, much fuel was wasted in the open-hearth furnaces by producing entirely from cold metal charges; this practice had to be continued until one of the blast furnaces could be reblown. This resulted in a monthly pig iron production of about 13,000 tons and enabled the works to double its steel output and greatly to reduce the cost of steel manufacture, for not only was there now hot metal for the steel works but also supplies of blast furnace gas, which could be used for steam-raising and for driving turbo-blowers, generators and gas-driven electricity generators.

During the early weeks of the recent power crisis Donawitz escaped from the industrial shut-down because it produced much of its own electricity, while its largest mill, a veteran of the 80's, was steam driven and thus able to operate under conditions that would have put the modern cogging mill out of action. As the fuel and power crisis grew more acute and more widespread, however, it affected almost every sphere of Austrian activity, until even Donawitz had to suffer. Early in 1947 the blast furnace had to be damped down owing to shortage of coke. This was a cruel blow to Austrian recovery. Despite the seriousness of the situation, however, the best was made of a bad job. Although pig iron production ceased completely during this period, steel production went on at a higher level than the equivalent period of 1946. But the darkest days of crisis restrictions are over for Donawitz, and not only is the blast furnace working fully but there are hopes of blowing in a second furnace. If this can be achieved Donawitz may be able to produce as much steel as it did in 1937, with all the corresponding benefit that that entails for Austrian industry and Austrian export trade generally.



General view of Donawitz works.

The history of the Donawitz plant, and the industries based on the Styrian ore before it, is both romantic and instructive.

The ease of mining and the good quality of the Erzberg ore, coupled with abundant supplies of charcoal from the local forests and the many and fast-running streams and rivers to create blast and to operate forging hammers and wire drawing mills, in ancient times combined to establish Styria as a high-grade iron and steel producing area. In the valley of the turbulent Vordernberger Bach near Donawitz, iron smelting was already well established by the twelfth century. The remains of the old charcoal blast furnaces, universally in use until the early days of the industrial revolution, are still to be seen in the Vordernberger valley and around Hieflau on the other side of the great Ore Mountain. With their turreted towers, these old charcoal furnaces look more like dis-used Baptist chapels than the remains of early iron works, and some of them indeed, are preserved as ancient monuments and for students of early metallurgy.

Monuments of Nature

It is a far cry from these picturesque relics to the great Donawitz plant of to-day which, with its long array of tall chimneys, its clusters of huge vertical cylinders, domes and inclined hoists, stands grouped as a massive monument to man's labours within the even greater monuments of Nature's mountains which surround it. The Alpine Montangesellschaft concern was founded in 1881, absorbing and modernising a number of smaller concerns in Donawitz and nearby towns. Pig iron production dates from the early 90's when the construction of the rack railway from the Ore Mountain had made it worth while erecting coke blast furnaces. From then until the collapse of the 1914-18 War the works steadily expanded. The main effect of the break-up of the Austro-Hungarian Empire on Donawitz (apart from more difficult access to many of its markets) was that it was cut off from the normal coke supplies, henceforth controlled by the re-born Poland. In the 'twenties and the early 'thirties the works went through difficult days. It went first into Italian and then into German ownership, being eventually absorbed into the Stinnes concern, which was itself taken over by the Vereinigte Stahlwerke of Düsseldorf (under which ownership it enjoyed the great advantage of coke supplies from the parent combine's own ovens in the Ruhr).

Donawitz under the Germans

Though badly hit by the economic crisis of the early 'thirties, it was doing profitable business just before the Anschluss, but the German invasion meant for Donawitz, as for the whole of Austria's industry, an over-ambitious expansion programme designed to feed the German war machine. Donawitz was forcibly transferred to the newly formed Hermann Göring Combine, which was less interested in the plant than in the development of the Styrian Ore Mountain itself. The intention was to erect an enormous integrated iron and steelworks at Linz having an annual capacity of two million tons of pig iron and the same amount of basic Bessemer and open-hearth steel and producing its own coke. The output of Styrian ore was to have been greatly increased for consumption with low grade Bavarian ore at Linz. The Linz iron and steel works were not intended primarily to produce armament steel, but to take advantage of their location on the Danube to develop the south-east European market as part of Germany's extended Lebensraum. The great disadvantage of the project was that Linz was remote both from coal and ore, both of which are costly to transport. The rapid overrunning by Germany of Alsace-Lorraine, with its vast ore deposits and many iron and steelworks, made the Linz project redundant, and construction ceased with the completion of half the originally-planned coke oven and blast furnace capacity, and a small steel works and plate mill forming part of the adjacent engineering plant.

Austria's Centre of Gravity

It would cost millions of pounds to complete the Linz iron and steel works and mills as a properly integrated unit and no amount of expenditure will ever overcome the disadvantage of its location. There is little ground for believing, therefore, that the centre of gravity of Austria's steel and iron industry will be materially changed, particularly as under modern conditions of fuel economy, it is more profitable for the plants to be located near the ore than the coal. A recently signed agreement with Sweden is intended to supply Linz with sufficient Polish coking coal to relight a further battery of coke ovens as well as one of the Linz blast furnaces, and to resume the production of steel and to increase the production of synthetic nitrogen Austria is to pay Sweden in the form of metallurgical products.

Donawitz To-day

To bring the history up to date, Alpine Montangesellschaft, in common with Linz, Böhlers and other important undertakings, was officially nationalised last summer Opinions may differ as to whether this is sound economics, but nobody will disagree that Austria's iron and steel industry, and the Alpine Montangesellschaft in particular, with its undertakings in brown-coal production, are vital to national reconstruction. Donawitz and the great Ore Mountain which feeds it, represent one of the greatest of all Austria's industrial assets, and one that is not necessarily thwarted by the temporary phenomenon of occupation.

A Review of F.I.A.T. Final Report No. 879

The Peeling of Nickel Deposits

THIS report has been prepared by a German consulting engineer, E. R. Thews, and contains a considerable amount of useful information regarding the causes of peeling of electro deposited nickel coatings and the various means of correcting the faults connected with this subject. Although the report comprises only 28 pages, including a list of relevant literature, the matter is dealt with in considerable detail.

When iron or steel surfaces are pickled with acidic solutions, the process liberates hydrogen gas which adheres to the metal forming an alloy. The presence of this alloy is responsible for the condition known as pickling brittleness. Not only is the degree of adhesion of an electro-deposited coating reduced by this effect, but in time the hydrogen is gradually released from the surface and adhesion between coating and base further deteriorates, producing the well-known phenomenon of peeling and flaking. To counteract this it is necessary to reduce hydrogen absorption by agitating the articles during the pickling process. Faulty degreasing of the metallic base often prevents satisfactory adhesion of the nickel plating and it is advisable for several degreasing treatments, using different solvents and processes, to be used in order to remove the last traces of grease.

Metallic impurity is an important factor when dealing with nickel plating problems. Small quantities of iron should not affect the nickel coating provided that the electrolyte is maintained at the correct *p*H value; the optimum *p*H suggested by Thews is 5.8 to 6.0. It has occassionally been noted that if the *p*H is such that basic iron salts are precipitated in the electrolyte, these may drift to the cathode causing non-metallic occlusions. When metallic iron is present to the extent of 1 per cent to 1.5 per cent or more, the nickel deposit tends to be more brittle than an iron-free nickel plating, but this can be counteracted by the addition of a compound which forms a complex with the iron, *e.g.*, citric acid or tartaric acid. Other details are also given in the report concerning the removal of iron compounds from the electrolyte.

Zinc Affects Adhesion

Although zinc is not normally present in the modern electrolytes used for nickel plating, it should be noted that this impurity can cause coatings to have a comparatively low degree of adhesion and a dark streaked appearance. The usual methods of removing zinc are discussed in adequate detail. Cadmium is sometimes added as a brightening agent for the nickel plate but the author stresses that the quantity used should be small in order to avoid producing an unsatisfactory appearance and short life in the coating. The gloss of nickel deposits can be increased by adding a small proportion of chromic acid to the plating bath, but even a small concentration (of the order of 0.002 oz. per gallon of solution) of this material can produce hard and brittle coatings. If the electrolyte is buffered with ammonium sulphate, however, the solution is less sensitive to the presence of chromium.

Inclusion of Organic Acids

Modern baths usually incorporate organic acids such as citric, acetic, or tartaric acids, etc., although this has the disadvantage of producing internal stresses within the coating. This phenomenon can be of considerable importance as it may cause changes in the degree of hardness and adhesion and produce brittleness. The quantity of organic acid added to the electrolyte depends to a large extent on the electrolytic conditions as well as the composition of the electro-plating solution. Slight excesses of organic acids can usually be eliminated by heating with hydrogen peroxide, ammonium persulphate, etc., depending on the acid used. A slightly excessive acid concentration can also be counteracted by the use of a normal buffering agent such as boric acid. Generally speaking the exact *p*H value of the solution depends as much on the impurities present in the bath as on the nickel itself.

Organic impurities may be present in the vats used for electrolytic work especially if birch, white wood, or deal has been used for their construction. These impurities must be removed by processes which vary according to the nature of the materials it is desired to eliminate; some are oxidised by hydrogen peroxide, others are absorbed by hydrated manganese dioxide, and certain impurities can be precipitated on scrap nickel cathodes by electrolysis. The advantage of using potassium permanganate as an oxidising agent, any excess of this reagent being removed by hydrogen peroxide, is fully discussed; the difficulties of using this technique are well known to all experienced in the art.

If there is an excessive concentration of nickel salts in the electrolyte a tendency to peel may often be apparent in the nickel deposit. Pores may also develop and the appearance of the coating is often dull. The disadvantages of using a hydrometer for calculating the concentration of nickel in

(*Continued on page* 332)

METAL-TO-METAL ADHESIVES

A WIDE range of industrial uses for thin metals has been made possible by a new development in the bonding of metal to metal by resin adhesives. Diversified industrial uses can be expected in the field of thin metals where neither welding nor riveting give the desired results.

While welding and riveting metals together are well-known techniques and have been widely used, they find their most efficient application in metals of substantial thickness. More recently attention has been directed to thin sheets of lightweight metals in aircraft construction. When used with such thin metals, rivets tend to cause stress concentrations, create uneven surfaces that impede free air flow, add appreciable weight when every added pound cuts down the speed, and produce weak joints; while welding thin metals is at best a difficult technique, accompanied by many variable hazards.

Until very recently complete and continuous adhesion between contacting metal surfaces was largely wishful thinking. Neither the materials nor the technique had reached a stage of development where industry could utilise them economically. The need for simpler methods of bonding metals was further emphasised by the tremendous requirements of the war effort. As a result, concentrated research was directed toward adhesives that would produce metal-to metal joints of maximum strength and durability.

The underlying principles of adhesion are not, as yet, well understood, and the advent of resin adhesives during the last decade has emphasised the need of more fundamental knowledge in this direction. An excellent summary of the situation, prepared by the U.S. Bureau of Standards, has been made available recently and contains an extensive bibliography on all phases of the subject for those who wish to investigate further.

Official Recognition Rare

Many types of metal-to-metal adhesives have been explored, some advanced enough to be given a trade name but only a very few have gained the recognition of government authorities by being given exhaustive examination for military equipment. One of these is a phenolic type applied as a liquid plus a powder, and cured under substantial heat. It is an adhesive of the phenol formaldehyde type and its durability is of the same class as the phenolics.

Most of the other metal-to-metal adhesives are proprietary products and their composition is known only in general terms. Most of them have substantial ratios of natural or artificial rubber which has good adhesive qualities with the metals. So far as is known all require the application of heat and pressure to secure a durable bond, and thin glue lines are important. Where rubber is a substantial component, the durability is usually somewhat lower in the scale than with the phenolics. There is little published data on their serviceability under severe service exposures. Hence the durability characteristics that are given here are the results of tests by government agencies, as well as by industrial organisations.

U.K.-Developed—U.S.-Produced

This metal-to-metal adhesive was developed by a British firm. Its production, however, was undertaken in the United States. The development of the adhesive resulted from a need for joining thin metal sheets with maximum smoothness for aerodynamic purposes, without the irregularities that result from riveting, or the heat distortion that usually accompanies welding. The first development work was in the aluminium alloys. The process is based on the use of two separate components, a liquid and a powder.

It is of the utmost importance that metal surfaces are thoroughly cleansed and freed from oil or grease immediately before the liquid is applied. A slightly roughened, rather than a smooth or polished metal surface is desirable for strong, durable joints. A simple test for an adequately cleaned metal surface is to flow water over the surface where it should form a continuous and unbroken film. The liquid is applied to the clean metal surfaces, by spray, brush or roller coating. Immediately after applying the liquid, the powder is sifted on the wet surface, enough to cover it entirely, and any surplus removed by light tapping.

The powdered surfaces are allowed to dry in order to permit solvent evaporation. For small areas 5 minutes may be found adequate, but for substantial areas 30 to 60 minutes is a safer basis to eliminate the hazard of steam blisters. Periods from 8 to 24 hours are permissible, and in some cases several days can be allowed. After the solvent has dried, the two coated surfaces are placed together, taped to maintain proper alignment, and pressed between steam-heated platens. During the bonding operation the adhesive first goes through a stage of plastic flow, during which the two components become intimately mixed, and then fuses to the metal surfaces, resulting in a strong, durable bond.

Metal-to-metal adhesives, so far, have been chiefly used in lap joints, in lieu of rivets or spot welds. The extent of distortion, or eccentricity is materially influenced

(*Continued on page* 332)

ELECTROLYTIC LEAD

(*Contd. from p.* 326)

so that it is crystal clear at all times. To ensure perfectly smooth dense deposits, a drop of clove oil is supplied to each tank, which simplifies the work. Although current densities can be much greater than formerly, it is more frequently restricted to 16 amps per sq. ft. Voltage commences at 0.35 and gradually increases as the electrolysis proceeds to 0.44 volt, but if the slime blanket is properly prevented from forming on the anodes by good working of the filter, it should not rise beyond the 0.40 volt limit, and further increases are often only due to resistances.

Variations of Physical Characteristics

The pure lead obtained by this method differs quite materially from ordinary electrolytic lead, and it has a tendency to form large crystals, the difference of which can sometimes be clearly portrayed by magnifying glass, without necessitating regular microscopical examination. Hardness as tested by the Brinell method is reduced from 4.2 to 3, elongation is increased from 64 per cent to 69 per cent, but tensile strength is reduced from 1.960 lb. per sq. in. to 1.600 lb. per sq. in. The manner in which this pure lead stretched under different conditions of heating and cooling made necessary the introduction of apparatus specially designed for making these examinations. Exacting tests revealed that although all ordinary forms of lead showed but little change in specific gravity on annealing, perfectly pure lead altered from 11.35 to 11.31. When tested chemically, it was found less easily corroded than other leads, particularly with sulphuric acid, and attracted a certain amount of attention in telephone researches even prior to the war. The matter of plastic flow showed that whereas ordinary electrolytically refined lead revealed little tendency to alter its size, creeping appeared with the perfectly pure metal. While under continuous load, and after repeated heating and cooling, the pure material permanently increased its length from 0.4 per cent to as much as 1.25 per cent, depending on the weight applied.

Ordinary chemical lead, on the contrary, either remained unchanged, or diminished in size by 0.5 per cent. Although these variations might appear to be somewhat small, it has to be remembered that in all nuclear researches so far undertaken, only the purest obtainable materials can be considered.

Increasing Wolfram Output in Spain.—The conclusion of a trade agreement between Spain and Italy, which provides, *inter alia*, for the shipment of 530 tons of Spanish wolfram, has lead to an increasing output and firmer prices.

NICKEL DEPOSITS

(*Continued from page* 330)

solution is emphasised and at the same time the value of chemical methods of analysis are stressed. Salts such as sodium chloride may occasionally be added to the nickel solution in order to reduce the electrical resistance of the electrolyte. This salt also exerts a considerable effect on the solubility of the nickel and, if used in too strong a concentration, will alter the nature of the electrolytic deposit. At the same time the disadvantage of not using conduction salts is instanced by the comparatively slow deposition of nickel and a tendency towards unsatisfactory appearance in the resultant film. Cyanide should not be present in the bath as this will cause the nickel deposit to flake. Many troubles are also associated with high current densities and the optimum values must be determined for each type of bath used.

This report also deals with the deposition of nickel on other metallic compounds and discusses the effects of excessive polishing. At the end of the report there is an extremely interesting summary of the various faults which may occur in nickel plating together with a useful list of the possible causes of each phenomenon.

This report is issued with the usual warning regarding the possible infringement of existing patent rights.

METAL ADHESIVES

(*Continued from p.* 331)

by the thickness of the metal and the length of the overlap. The simplest form of lap is the plain square end overlap. It might be expected that a lap 1 in. long would be twice as strong, in shear, as a lap ½ in. long, but such is not the case. The disturbing influence is the elasticity of the metal, together with the distortion noted above, which causes greater stresses at the extremeties of the lap than at its centre. It has been determined that the strength of the metal-to-metal lap joint varies directly as the width.

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American Chemical Notebook

From Our New York Correspondent

President E. F. Bullard of the Stanolind Oil and Gas Company (a subsidiary of the Standard Oil Company of Indiana this week, announced that a long-term contract has been concluded between Stanolind and the U.S. Industrial Chemicals Company, Inc., calling for the sale of all the water-soluble oxygenated chemicals that will be produced at the first two synthetic gasoline and oil plants using the much publicised Fischer-Tropsch process. The plants are being undertaken by the Stanolind Company and the Carthage Hydrocol Corporation, and plans also call for the erection of two United States Industrial Chemicals plants for the production of other products using some of the Fischer-Tropsch chemicals as raw materials.

It is estimated that the chemicals produced from these Fischer-Tropsch plants may exceed a total of 300,000,000 pounds annually, and include ethyl alcohol, methyl alcohol, normal propyl alcohol, normal butyl alcohol, normal amyl alcohol, acetone, methyl ethyl ketone, acetic acid, propionic acid, butyric acid, acetaldehyde, propionaldehyde and butyraldehyde. In addition, United States Industrial Chemicals will produce esters, higher alcohols and other chemicals from some of the primary products which will add substantially to the number of products made available by this development.

It is said that the larger quantity of organic chemicals which will be made available through the new process will mean a dependable source for much needed chemicals at prices competitive with those from any other synthetic or fermentation process. The larger quantity of important chemicals available, United States Industrial Chemicals claims, will stimulate the development of new solvents, plasticisers, pharmaceuticals, plastics and other chemical products.

* * *

The U.S. Department of Agriculture last week announced an emergency export allocation of 3000 short tons of linseed oil which had been acquired by the Commodity Credit Corporation from Argentina. This oil will be re-exported by the present commercial holders, and is in addition to the 8250 long tons announced on August 7. These re-exports are from the two recent purchases made by the Commodity Credit Corporation of 32,000 and 40,000 tons, respectively. The 3000 tons announced this week will be re-exported as follows: Phillipines, 1000 tons; Australia, 650 tons, Czechoslovakia, 100 tons; Belgium, 750 tons, and Netherlands, 500 tons.

Production of most inorganic chemicals in the United States continues at a high level with the output of many of them above that of a year ago, L. L. Horch, New York regional director of the United States Department of Commerce, declared last week on the basis of the department's August "Chemicals and Drugs Industry Report." The report cited improvement in the persistent alkali shortage and predicts that next year's output will be ample to meet requirements.

The domestic demand for bichromates has slackened, and practically all needs have been fulfilled. Other conclusions reveal that industrial requirements for nitrogenous compounds are also being met without difficulty. Phosphatic compounds, however, are still in short supply, particularly the sodium phosphates which require alkalis for their manufacture. . Sodium sulphates are in short supply, but sulphur and sulphuric acid orders are being met. The report anticipates a brighter outlook for coal tar crudes, record production of acetone, acetic acid and many other non-cyclic organic chemicals, larger fertiliser sales and an eased situation on insecticides. Paint sales continue high with prices generally unchanged.

* * *

From September 1, the chemical division of Koppers Co., Inc., started production of sulphuric acid at its new plant recently erected at Kearny, New Jersey, adjacent to the company's Seaboard coke plant. Ronald Barraclough, manager of the new plant states that in addition to the production of sulphuric acid, hydrogen cyanide manufacture will commence sometime in October while other related chemicals will be produced next year. When the new plant is in full operation it will be capable of producing some 21,000 tons of sulphuric acid and 1,200,000 pounds of hydrogen cyanide per year.

According to Mr. Barraclough, sulphuric acid will be produced from hydrogen sulphide recovered from coke-oven gas produced by the adjacent Seaboard plant and from crude brimstone, and while the plant is a separate entity of the chemical division, it will be closely integrated with the Seaboard plant. Hydrogen sulphide, for sulphuric acid production, will be obtained by hot vacuum activation. This removes hydrogen sulphide from the crude gas, both purifying it and obtaining materials for the sulphuric acid production.

CHEMICAL PRODUCTION JAPAN

PRODUCTION of chemicals in Japan increased during March because of improved deliveries of coal and lignite, and the relaxation of restrictions on the use of electric power, states Report No. 19, issued by General MacArthur's headquarters. Output of basic chemicals is given as 31 per cent of estimated requirements for a balanced economy, *i.e.*, an increase of eight per cent over the February level.

Output of ammonium sulphate had reached a post-war peak of 63,987 metric tons, amounting to 85 per cent of present capacity. Increased calcium carbide deliveries led to a 35 per cent rise in the output of calcium cyanamide. However, the production of 13,237 metric tons fell short of the planned output because most factories had low fuel stocks. Insufficient deliveries of pyrites to phosphate plants in the early part of the month resulted in a serious shortage of sulphuric acid for superphosphate production. Later in the month, however, pyrite deliveries were given the same transport priority as coal and coke, with the result that 110,726 metric tons of sulphuric acid were produced during the month—a record.

Imports of common salt amounted to 57,667 metric tons, while 11,562 metric tons were produced locally, total supplies being equal to only 48 per cent of requirements. Increased production of electrolytic caustic soda, soda ash, hydrochloric acid and liquid chlorine are reported, but total supplies still cover only a fraction of requirements. An increase in the supply of coal-tar products can be attributed to more extensive coking activities and a further increase is expected because several plants were to start scrubbing coke gas in April. Crude benzene output exceeded that of February by 27 per cent.

In the dyestuffs field, production of sulphur black and khaki colours, of which considerable stocks are available, decreased in March, and raw materials were diverted to the manufacture of dyestuffs required for textile exports. Output of direct and acid dyestuffs exceeded the February level by about 25 per cent. However, output of acetylene derivatives declined.

Italian Fertiliser Output Up.—Output of nitrogenous fertilisers in Italy totalled 1,686,000 quintals in the first half of this year, compared with 1,422,000 quintals in the second half of last year and with only 754,000 quintals in the corresponding period of 1946. It is hoped that this year's output will aggregate about 3,500,000 quintals.

SULPHURIC ACID PRODUCTION IN S. AMERICA

AN increasing output of sulphuric acid may conveniently be taken as a yardstick for the development of any country's heavy chemical industry. According to recent reports reaching London, output of sulphuric acid in South America is at present about twice as high as before the war. The major countries, both as regards production and demand, are Argentina, Brazil and Mexico. Before the war, total requirements amounted to about 100,000 tons, of which 97 per cent had to be imported. Output for 1946, however, amounted to nearly 200,000 tons and it is reported that the capacity of plants planned, or actually in course of construction, totals 250,000 tons. For instance, a well-known Belgian chemical group is to erect plants in Argentina where, in addition to sulphuric acid, other industrial chemicals, such as ammonia, ammonium nitrate and nitric acid are to be manufactured. The country's output totalled 66,840 metric tons last year, and when three further plants are completed (in the Mendoza, Cordoba and Santa Fé Provinces) output will be doubled.

Four New Plants for Brazil

In Brazil, the manufacture of sulphuric acid is concentrated in the Sao Paulo area, but there are two plants in other parts of the country. Four additional plants, working on the contact process, are planned, one of which is to supply an oil refinery in Rio Grande do Sul with the necessary sulphuric acid, while a second plant is to supply a rayon factory. The delay in the shipment of equipment from the United States, however, has caused a considerable slowing down of the erection of a plant near Volta Redonda, but it is hoped to complete it in the second half of 1948.

In Colombia, there are two plants, one at Medellin, and a more recent one at Barranquilla, with a combined output of over 9000 metric tons. There is one plant in Peru, and should an electrolytic zinc plant, for which plans are in hand, be eventually erected, output of sulphuric acid (which would be derived as a by-product) would be increased. In Montevideo, Uruguay, there is one chamber plant, with a contact plant under construction, to produce 15 tons a day.

Mexico, which has seven factories producing at a rate of 32,500 tons a year, could increase output to nearly 60,000 tons. Should oil refining operations increase now that settlement of the long-standing nationalisation dispute has been reached, a better utilisation of the existing sulphuric acid manufacturing capacity might be expected.

Chemicals from Farm and Forest

Recent Progress in Chemurgy

IN *Chim. et Ind.* 1947, 57 (5), 431-440 (May), H. T. Herrick, of the U.S. Department of Agriculture, presents an interesting, illustrated account of the industrial utilisation of waste and surplus products, mainly from the farm, but equally applicable to those derived from forests and fisheries. In its widest sense, chemurgy would seem to comprise the working up by chemical or other means of any material derived from these sources, but more specifically it applies to waste, surplus, or inferior material unsuitable for direct use. Its early history in the U.S.A. dates from about 1862, when attempts were made to utilise surplus crops of fruit, such as grapes, for wine production. During subsequent periods of agricultural depression it has provided additions to the farmers' income as well as proving a useful source of raw material for the chemical and allied industries.

Money for Research

A considerable amount of work along these lines had been accomplished in various research establishments before 1938, but in that year progress reached its consummation in the allocation by Congress of 4 million dollars to the Department of Agriculture, for chemurgical research, including new regional experimental stations at Peoria (Illinois), New Orleans, Philadelphia, and Albany, near San Francisco. The Peoria establishment included two laboratories already in existence, namely, the Soya Bean Products Laboratory (1936) and the Farm By-Products Laboratory at Ames, in Iowa (1931). In each of the four new buildings a large amount of space was allocated to equipment for work on a semi-manufacturing scale, so that reliable data could be obtained as to actual factory methods and costs. Herrick says that considerable progress has been made, partly stimulated by the exigencies of war which made it still more necessary to concentrate on practical and realistic ends.

The principal results obtained are summarised under the following heads: farm residues, lucerne, animal fats and oils, apples, cereals, cotton, fruits, skins, leathers and tanning materials, dairy products, oilseeds, groundnuts, egg products, sweet potatoes, tobacco, vegetables and potatoes. From these is obtained a wide and varied range of products such as paper material, xylose (wood sugar) and lignin, together with derivative chemicals from straw, sugar cane, bagasse, etc. From maize stalks and rice waste, valuable preparations for removal of deposited carbon and oil from aircraft engines have been obtained. A considerable amount of so-called lucerne flour is now prepared from the legume of that name. Animal fats, such as lard and tallow of lower than edible grade, are now largely used in the manufacture of synthetic rubber and, of course, also for soap and lubricants. Apples unfit for direct use are being increasingly employed for production of a syrup "miel de pomme" to the extent of 4000 tons of the "honey" per annum; also for manufacture of pectin and *fruits glacés*.

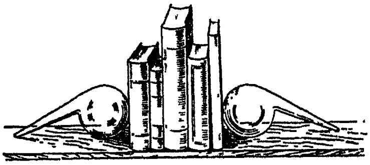
Use of Cereals

Cereals not required for foodstuffs are used in the manufacture of starch and alcohol. Cotton already has a number of new applications, including more particularly that of tyre cording, special types of surgical bandages and of fireproof cotton articles. Under the heading of fruits (waste and surplus), particular reference is made to Velva Fruit, another type of *fruits glacés* for which there is said to be increasing demand. In the work on skins, leathers and tanning materials a primary aim is that of discovering other sources of tannin to augment or replace the normal sources which have been seriously affected by insect attack. Among dairy products the most important are casein and lactose. More than 3000 tons of the latter are now employed in the manufacture of penicillin, and quite large quantities are also used in producing the elastomer Lactoprene, lactic acid, etc. A special kind of silk is now made from casein.

Oleaginous Crops

The principal oleaginous crops in the U.S.A. are cotton-seed, linseed, soya bean and groundnuts. Acreage under the two latter has been enormously increased in recent years. The already numerous products of the soya bean are being improved, and new ones developed, attention being particularly directed to the use of the oil for paints and varnishes and as a rubber substitute. Groundnut flour, a cold-setting glue, gummed paper, and water paints are also being improved.

Research on tobacco mainly relates to nicotine and preparation of new and more effective insecticides. Large quantities of special starch—up to 25,000 tons per annum in one works—are now made from sweet as well as ordinary potatoes. Work on dehydration of these and other vegetables forms an important part of the programme.



A CHEMIST'S BOOKSHELF

Modern Advances in Inorganic Chemistry. By E. B. Maxted. Oxford University Press, London. pp.vi+296. 20s.

It is a regrettable but inevitable consequence of the advance of science that one can no longer keep abreast of all developments in the field of chemistry by merely following the literature. Nowadays, it is necessary to have summaries, produced by workers in the field, to give a broad grasp of the growth and the present state of the various branches in essentially non-specialist fashion. The digesters, if one may so refer to them, have a function which is almost, if not equally as important as the primary producers.

The work under review puts before us a selection of topics from the field of inorganic chemistry. The first chapter, which is a comprehensive, physical introduction to atomic and molecular structure, deals with the ultimate particles of matter, and shows how they bear on the structure of the nucleus. After a brief discussion on the history of the electronic structure of the atom, the author deals with the quantum mechanical views of the structures of the different atoms before proceeding to the bonding and formation of molecules, both from the theoretical and practical points of view. All these matters have to be grasped before one can become conversant with the newer work on inorganic chemistry.

Hydrogen, which has always stood as an element apart, has a chapter to itself. Atomic and molecular hydrogen receive attention first, followed by a detailed account of deuterium and its compounds. A reference to tritium concludes the chapter. The recent chemistry of the halogens consists primarily of a discussion on the oxides of the halogens, and the inter-halogen compounds—hafnium, rhenium and masurium—are considered at some length.

On the physical side, some space is devoted to the behaviour of gases in discharge tubes, some attention being paid to the reactions which may occur there as a result of the existence of atomic gases or free radicals. This leads up to a consideration of the preparation and uses of artificially radioactive elements. As this is nowadays a common newspaper topic, it is useful to have an *authoritative* account of work in this field. The subject is, indeed, an obvious candidate for inclusion in any work on modern inorganic chemistry, as is also the last chapter on uranium and the trans-uranic elements. The published information on this last subject (if one ignores the mass of material which has appeared in the popular press) is, unfortunately, still meagre, so that this chapter, through no fault of the author, is by no means as full as one could have wished.

The author may be criticised for his apparent acceptance of the existence in nature of tritium and masurium. If the author feels he can accept these two claims on the published evidence, then he should in all fairness point out that there is a strong body of opinion holding the contrary belief. The late Lord Rutherford was incisive in his remarks on the natural occurrence of tritium; and while he may have been wrong, theoretical considerations suggest strongly that if artificial radioactive H^3 can be produced (and on this point there seems little doubt) then a stable natural H^3 is not probable.

As for masurium, it seems incredible that its development has not kept pace—even in tortoise-and-hare fashion—with that of rhenium, if it occurs in the concentrations claimed by the Noddacks. Consequently the reviewer is content to follow Perrier and Segre, and to call the element *technetium.*

These are relatively minor criticisms of a work which is commendably up-to-date, especially when one bears in mind the rapid and comparatively recent advances in some of the branches with which it deals. The book is very readable, and the publishers continue to uphold their reputation for the production of books of good value and great worth.

Asbestos in Italy

In spite of the fact that large quantities of asbestos have been imported into Italy by U.N.R.R.A., the situation remains precarious. It is difficult to use the imported asbestos as it is made up of very short fibres. Local production cannot be relied upon, for the two mines existing at Val d'Aosta and at Valtellina yield only small quantities and no increase can be hoped for. The demand on the other hand is constantly increasing as fireproof tubing, cloth and panels are badly needed in various fields and the building industry also has its demands. There is no other remedy except to import a suitable quantity of good quality asbestos.

Home News Items

U.S. Coal Arrives in London.—A cargo of 9000 tons of coal from the U.S. arrived in the Thames last week in the collier *Coulbeg*. It was discharged at Swanscombe and at Purfleet for commercial use.

Mining Survey.—A survey now being undertaken by mining engineers in the Strontiam district of Ardnamurchan, North Argyllshire, will include the extensive workings of the lead mines which have been closed for more than a hundred years.

Electrodeposition Conference.—Under the auspices of the Electrodepositors' Technical Society, an International Electrodeposition Conference is to be held at the Hyde Park Hotel, from September 17-19. An exhibition illustrating recent developments in electrodeposition research and practice will be on view at the hotel during the conference.

Strain Gauge Demonstration.—Representatives of the technical Press, after being entertained to lunch by the directors of Vauxhall Motors, Ltd., at the Hungaria Restaurant on Tuesday last, witnessed a demonstration of a strain gauge with which the company has been carrying out extensive research and development work at its Luton establishment.

New Latex Company.—Under the auspices of Harrisons and Crosfield, a new company is to be registered in Malaya for the purpose of organising the collection of latex and providing buildings and plant for its concentration. The capital will be provided by companies associated with the above mentioned firm and operations are planned to commence before the end of next year.

Sub-surface Coal Operators.—Miners working with modern equipment will shortly produce 500 tons of good quality coal daily from a worked-out outcrop coal site at Essington, near Cannock, Staffs. Opencast methods had to cease when the seam became too deep to work. Two one-in-five gradients will be tunnelled, and a conveyor belt will bring the coal direct to the surface where it will be screened and mechanically loaded into lorries.

Engineering and Marine Exhibition.—The Engineering and Marine Exhibition was officially opened on Thursday of last week by Mr. Chuter Ede, the Home Secretary. The exhibition will close on September 13. Speakers at the inaugural luncheon were Mr. A. V. Alexander, Lord Dudley Gordon, and Lieut-Col. H. Riggal. Overseas visitors were later entertained to dinner under the presidency of Lord Dudley Gordon, speeches being made by Mr. C. Bentham and Mr. W. H. Kitson.

Skip Winding at Lancs. Colliery.—Skip winding equipment successfully installed at a new seam of Astley Green Colliery, is expected to raise weekly output from 9000 to 14,000 tons.

F.B.I.'s Note to Prime Minister.—The Federation of British Industries has addressed a communication to the Prime Minister recommending steps to be taken to deal with the economic crisis.

Paraffin and the Dollar.—Of the 172 million gallons of paraffin imported over the six-month period ending June 30 last, only 32 million gallons came from the U.S., said Mr. Shinwell last week. The remainder came from the West Indies it was disclosed.

Coal-Saving Furnaces.—When the first of several furnaces being converted by the Cargo Fleet Iron Co. (Middlesbrough) to oil burning comes into operation soon, there will be a weekly saving in coal consumption of 300 tons. Each furnace is said to consume about 250 tons of fuel oil a week.

Photography Exhibition.—The Institute of British Photographers is holding an exhibition at 74 South Audley Street, London. It opened on Thursday last, and visitors will be admitted daily (except Sundays) from 9 a.m. to 7 p.m. until September 30.

Mobile Atomic Energy Exhibition.—Two L.M.S. railway coaches which until recently housed a mobile penicillin exhibition, are now to be used for an exhibition of atomic research and experiment. Organised by the Atomic Scientists' Association and the Ministry of Supply, the exhibition will tour many Yorkshire industrial centres early next year.

OFFICIAL NOTICE

Washing Soda Prices

The Board of Trade, after consultation with the Central Price Regulation Committee, have now withdrawn the cash maximum prices formerly fixed for washing soda, and prices will now be subject to the Prices of Goods Act, 1939. This is affected by the Washing Soda (Maximum Prices) (Revocation) Order, 1947, and the Prices of Goods (Price Regulated Goods) Order, 1947 (b).

The effect is that traders, including manufacturers, will henceforth be allowed to exceed their 1939 selling prices only by such extent as is justified by increases in defined costs. This change takes effect as from August 27, 1947.

Personal

Sir Frederick Bain, a deputy chairman of I.C.I., and president of F.B.I., who is at present in Australia on I.C.I. business having previously visited Canada and the U.S.A. on F.B.I. affairs, and who has been away from this country since May last, is returning on September 13.

Dr. E. Talbot Paris, Ministry of Supply radar expert, received the American Medal of Freedom with bronze palm at the American Embassy last week. The accompanying citation refers to "meritorious service during the war in the field of scientific research development."

Mr. Lennox Bertram Lee has resigned his directorship of the Calico Printers' Association having as recently as June 30 retired from the chairmanship after 39 years in that office.

Mr. T. E. Waller has been appointed deputy district manager of Dunlop's Nottingham depot to which he has been attached since he left his post of tyre inspector with the Ministry of Supply last year. He has been with Dunlop since 1912 and first came to Nottingham as service representative in 1928.

Mr. H. J. Ross is to become deputy chairman of the board of the Distillers Company, and **Mr. L. A. Elgood** is to be chairman of its management committee. **Mr. A. F. McDonald** is to be the company secretary, and **Mr. J. F. Dempster** the deputy secretary.

Mr. James Bruce Leask has become a director of Harrisons & Crosfield, the appointment having effect from Monday last. Mr. Leask has been actively associated with the company for the past 27 years having recently retired as chairman of Harrisons & Crosfield (Malaya).

Mr. N. F. Stockbridge has been appointed a director of Vauxhall Motors.

Mr. Charles Young has been appointed a director of Hardman & Holden, Limited, and will be responsible for all sales matters.

Mr. C. K. F. Hague, managing director of Babcock & Wilcox, and **Mr Noel Carrington**, a director of Royle Publications, have received Board of Trade appointments as additional members of the Council of Industrial Design.

Mr H. F. Oppenheimer has been appointed a director of Rhodesia Copper Refineries in succession to Mr. W. D Wheeler who has resigned.

The weaving supervisor of British Celanese, who with Dr. Illingworth and Mr. Eyre has been elected a Fellow of the Textile Institute (as mentioned in the Personal column of The Chemical Age last week), is **Mr. J. L. F. McDowell**.

Obituary

Mr. Andrew Jollie, who was a director of United Steel Companies, and until quite recently the chairman of the parent company—Steel, Peech & Tozer—died last week at Edinburgh. Until March of last year he was also chairman of the National Association for Rolled and Re-rolled Steel Products, of which he was one of the founders.

Sir Harold Kenward, a director of Dunlop Rubber Co., Ltd., who was on his way to North America last week to visit the company's plants at Toronto and Buffalo, died suddenly on the *Queen Elizabeth* in mid-ocean.

Major J. S. Baker, a director of Baker Perkins, Ltd. and a past chairman of that company, has died in the U.S. where he was negotiating with the American Baker Perkins Company. Major Baker, who was 66, was the grandson of the company's founder.

Dr. David Jones, one of the foremost authorities on mining and metallurgy in the country, was killed last Saturday evening in a road accident between Amesbury and Durrington. Dr. Jones, who was 48, was recently appointed to the Chair of Mining at Birmingham University after 11 years as head of the mining department at Cardiff. He was made a C.B.E. this year.

Coal Price Increase

Commenting on the increase in coal prices on August 25, Sir Andrew M'Cance, joint managing director of Messrs. Colvilles, Ltd., in an interview, stated that so far as his firm was concerned this would increase the cost of production by a corresponding amount, and as Britain's costs were already high compared with costs elsewhere, it was bound to affect our ability to export. It was the result of the five-day week and other concessions to the miners. The rest of the country had to pay for it.

Referring to the estimated current loss of 3s. 9d announced by the National Coal Board, Sir Andrew added that that was almost certain to happen. Anyone who knew anything about coal mining realised it was inevitable because of the decreased output per man. All these things were not unexpected. They were the fruits of nationalisation.

Sir Henry Tizard, has been elected president of next year's annual meeting of the British Association to be held at Brighton.

Overseas News Items

Malayan Tin Output.—Malayan output of tin and tin-in-ore at 75.5 per cent in July totalled 2520 tons.

The Solexol Process.—The Baltimore plant of Lever Brothers Co. is expected to be in production this autumn, employing the Solexol process for refining fats and oils.

Russo-Indian Chemical Trade. — To develop trade in fertilisers, chemicals and dyestuffs between Soviet Russia and India, an Indian delegation is to go to Russia.

Canadian Casein Output Up.—According to official Canadian statistics, output of rennet and acid casein rose from 1,679,000 lb. in the first half of 1946 to 2,622,000 lb. in the first half of this year.

Indian Shellac Exports Down.—India's shellac exports declined in July to 6506 packages, against nearly 12,000 packages in the previous month. Seedlac shipments, on the other hand, rose from 5330 to nearly 8750 packages.

German Chemical Plant for Britain.—According to a statement by the Inter-Allied Reparation Agency of Brussels, Great Britain has received a chemical and physical laboratory from the Dusseldorf plant of Haniel and Lueg.

French Rayon Price Increase.—Prices of all kinds of artificial silk in France have been increased by order of the French Price Administration. Viscose rayon has risen from Frs. 139.30 per kilo to Frs. 167.25, and viscose staple fibre from Frs. 83.85 to 90.10.

German Chemical Developments.—The Wolfen chemical plant in the Soviet Russian zone is reported to be engaged in the manufacture of Mersol, a detergent intermediate of which about 12,000 tons is expected to be produced this year, as compared with only 3000 tons in 1946.

Kenya Pyrethrum Market Conditions.—Kenya pyrethrum growers are reported to be anxious regarding the future of pyrethrum, fearing that after the end of the current year, the price may represent a loss to the grower. Some farmers are already said to be reducing their acreages, retaining only high-toxic plants.

U.S. Linseed Substitute.—Because of the excessive price for linseed oil, demanded by Argentina, the U.S. has successfully evolved a substitute product, being a mixture of tung and soyabean oils. This has lead to a noticeable change in the supply position and it is reported that licences have already been granted for the export of 5900 tons of U.S. linseed oil stocks.

French Chemicals for Poland.—Chemicals are included in a list of goods to be sent to Poland in exchange for 1,000,000 tons of coal.

U.S. DDT Output.—The present production rate for DDT in the United States is about 50,000,000 lb. per annum, a figure somewhat higher than present demand.

New Chemical Plant in Chicago.—A new plant has recently been completed in Chicago by the Glidden Corp. for the production of soya sterols to be used in the manufacture of sex hormones.

Imports Prohibited.—A supplementary list of commodities just issued by the Chief Controller of Imports, New Delhi, includes glass substitutes, micarta sheets, pyrotechnic aluminium powder, and plastic manufactures.

New German Lignite Mining Company.—A new company, the Seligenstaed A.G., has been formed in Gera, U.S.S.R. zone of Germany, with a capital of 100,000 marks, to exploit recently-discovered lignite deposits in the town's neighbourhood.

Prospecting in Pakistan.—The Government of Pakistan is to inaugurate an extensive programme of oil, coal and iron prospecting in the Dominion as part of a plan to start up essential industries at present non-existent.

British Guiana to Cut Imports.—With a view to assisting Britain over her present financial difficulties, British Guiana is to cut imports from all sources, and at the same time increase exports of bauxite, gold, sugar and timber.

Spain/Sweden Trade Pact.—A new trade agreement between Spain and Sweden provides for the mutual interchange of products to the value of 43 million Swedish crowns on each side. Approximately two-thirds of Spanish purchases will consist of chemical wood-pulp.

Zeiss Works to Make Microscopes Again.—It is reported that the Zeiss Works in Jena are to resume the manufacture of microscopes at the end of this year. The number of employees is to be increased simultaneously by 1000 to 6000. The 1939 figure was 7000 operatives.

French Steel Combine.—The two leading French steel concerns—Denain et Anzin and Nord et L'Est—have combined for the purpose of pushing a steel modernisation programme in France. A 15 million-dollar order for equipment has already been placed with United Engineering & Foundry Co.'s plant at Youngstown.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

SCRIVENS LTD., Birmingham, manufacturing chemists. (M., 6/9/47). July 22, £1460 mortgage to Birmingham Citizens Permanent Building Society; charged on 53 Rymond Road, Ward End, Birmingham. *Nil. January 16, 1947.

BRITISH ALUMINIUM CO. LTD., London, E.C. (M., 6/9/47). July 30, disposition by W. N. Craig with consent granted in implement of a Trust Deed dated September 12, 1934; charged on land with cot. known at Ourequay, and other erections thereon at Burntisland. *£3,135,559. April 11, 1947.

NORTH BRITISH ALUMINIUM CO. LTD., London, E.C. (M., 6/9/47). August 1, Trust Deed dated July 30, 1947, securing £3,500,000 3 per cent deb. stock of British Aluminium Co. Ltd., and premium of 1 per cent; charged on deb. stock and shares, properties, set out in schedule to Deed and general charge (subject to &c.). *——. Mar 25, 1947.

Company News

The name of **Morris Ashby Smelting Co., Ltd.,** 10 Philpot Lane, London, E.C.3., has been changed to Deanshanger Oxide Works, Ltd., as from August 1, 1947.

The Staveley Coal and Iron Company has acquired the whole of the shares in Beswick's Limeworks. Limited, of Hindlow, near Buxton.

The name of **Vocalzone Company Ltd.,** chemical manufacturers, etc., 12 Lammas Street, Carmarthen, has been changed to Vocalzone Limited, as from August 7, 1947.

The nominal capital of **Morhams, Ltd.,** manufacturing chemists, etc., Torquay, has been increased beyond the registered capital of £100 by £9,900, in £1 ordinary shares.

Yardley & Co., soap and perfumery manufacturers, is to sub-divide the ordinary £1 shares into one ordinary share of 4s .and four "A" ordinary shares of 4s. each. Present issued capital is £363,810 including £289,080 of ordinary £1 shares.

The nominal capital of **Kelro Chemical Co., Ltd.,** 23 Crabb Street, Rushden, has been increased beyond the registered capital of £2000, by £8000, in £1 shares.

The nominal capital of **Cambrian Chemical Industries, Ltd.** (formerly Chemical Sales, Ltd.) 9 Victoria Street, London, S.W.1., has been increased beyond the registered capital of £200, by £4800, in £1 shares.

The Calico Printers' Association has announced a net profit for the year just ended of £407,237, compared with £313,611 last year, and has recommended payment of a dividend of 5 per cent, less tax, on the ordinary stock.

The nominal capital of **British Drug Houses, Ltd.,** 16-34 Graham Street, London, N.1, has been increased beyond the registered capital of £1,325,000, by £925,000, in 225,000 non-redeemable preference shares of £1 and 2,800,000 ordinary shares of 5s.

The nominal capital of **Hess Products, Ltd.,** manufacturers of and dealers in fats and oils, chemical and other substances, etc., 26 Park Row, Leeds, 1, has been increased beyond the registered capital of £32,500 by £12,500 in £1 ordinary shares.

Midhurst White, manufacturers of fertilisers and bricks, although paying no interim, is maintaining its dividend at 10 per cent for the year. Net profit amounted to £10,500 as against last year's figure of £14,300.

Beralt Tin and Wolfram is paying a dividend of 25 per cent on the £331,000 capital for the year to March 31 last, also an interim dividend of 20 per cent on account of the year to March 31, 1948. For 1945-46 a dividend of 10 per cent having been distributed in respect of each of the preceding six years.

Chemical and Allied Stocks and Shares

WITH the Government's crisis plans being announced in instalments, stock markets reflected continued uncertainty, prices in most sections falling back further, moderate selling having a marked effect, the volume of business declining, and buyers being extremely cautious. Owing to prevailing uncertainties, weakness of industrial shares was in sharp contrast to a further rally in British Funds which were in better demand with 2½ per cent Consols and Treasury Bonds showing a further rally on balance. Marking down of industrials was indiscriminate and chemical and allied shares again reflected the prevailing trend.

Imperial Chemical were down to 41s. 9d., and now yield over 4¾ per cent on the basis of last year's 10 per cent distribution which it is generally assumed should be maintained unless there is another serious fuel crisis in the winter. Moreover, the market believes that in due course I.C.I. £1 units are likely to be split into four of 5s. each. Reflecting the general tendency, Monsanto Chemical declined to 48s. 9d. Fisons were again 60s. and both B. Laporte and W. J. Bush were 90s., but Glaxo Laboratories further declined to £15½. Lawes Chemical 10s. shares were 14s., Major & Co.'s 2s. ordinary 3s. 3d., Greeff-Chemicals Holdings 15s., and Borax Consolidated were 49s. 4½d. United Molasses were down to 40s. Dunlop Rubber only 62s. 9d., and Levers 46s. 9d. Associated Cement were lowered to 60s., and British Plaster Board to 23s. 6d.

Despite the bumper results, the units of the Distillers Co. receded to 128s. 6d.; the impending consolidated accounts are expected to show exceptional strength. British Glues and Chemicals 4s. shares have remained steady at 19s. 6d., General Refractories were 21s. 6d., Amalgamated Metal 16s. 6d., and Imperial Smelting 18s.

Textiles were unresponsive to the 5 per cent dividend announced by Calico Printers —the first dividend on the ordinary shares for sixteen years. Calico Printers were 19s. 9d. with Bradford Dyers 20s. 6d. and Bleachers 10s. 4½d. Courtaulds at 43s. regained part of an earlier decline. Iron and steels were subdued earlier in the week, influenced by T.U.C. nationalisation discussions. Stewarts & Lloyds were 45s. 9d. Dorman Long 23s. 9d., United Steel 23s. 6d., and Colvilles 24s. 6d., while Tube Investments were £5 13/16, and elsewhere, British Aluminium went back to 41s., and British Oxygen to 87s. 6d. Although lower on balance, movements in the electrical equipment section were relatively moderate, General Electrical being 84s. 6d., English Electric 52s., and Associated Electrical 73s. 9d. Gas Light & Coke were 20s. 4½d., and other gas stocks were also little affected by the view that a Bill for nationalisation of the industry may be announced during the next session of Parliament.

Boots Drug went back to 54s. 6d. reflecting the general set-back in shares of companies with large stores interests. Timothy Whites at 39s. 6d. were also lower with Beechams deferred down to 21s. Elsewhere, Wall Paper Manufacturers deferred fell to 41s., and paint shares reflected the decline in building and allied shares which were affected by fears of slowing down in the housing programme. Pinchin Johnson were 52s. 9d., and Goodlass Wall 33s. 1½d. Oil shares showed considerable uncertainty, falling back after news of the decision to abolish the basic petrol ration, and failing to rally after the increase in the price of petrol. Sentiment in regard to the big oil groups was affected by the French decision to limit imports of oil. Mexican Eagle advanced from 14s. 4½d. to 21s. 3d., following news of the settlement terms with the Mexican Government.

British Chemical Prices

Market Reports

PRESSURE for supplies has been the main feature in the market for industrial chemicals during the past week, and the movement in the aggregate has been fairly substantial. The volume of inquiries for overseas destinations has also been well maintained but actual bookings for export, so far as the scarce items are concerned are unavoidably restricted by the priority requirements of the home-consuming industry. Chemicals for the textile industry and paint raw materials have been in active request and delivery specifications, it is understood, are being met with reasonable promptness. No special section of the market calls for comment, the price position throughout continuing on a very firm basis, and against the background of recent costs there appears to be little likelihood of any change in the position in the immediate future. The output of coal-tar products is being fully absorbed and a fair-sized export trade has been met, notably in creosote, cresylic acid and naphthalene.

MANCHESTER.—Holiday influences on the Manchester chemical market have again been less in evidence during the past week, and the call for contract deliveries of textile and other industrial chemicals has been on fairly steady lines. There have also been plenty of new inquiries about for home users and for shippers, and additions to order books in most of the leading products have been reported. In the fertiliser section the demand, on the whole, has been no more than moderate. There is a brisk call for most of the tar products, quotations for which are on a very firm basis.

GLASGOW.—In the Scottish chemical market shortage of Glaubers and soda crystals has been much accentuated by the hot weather which has again made crystallisation difficult. Demand for these materials and trisodium phosphate has been heavy. There has been no improvement in the supply position of any material worth recording. Such materials as acetone and trichlorethylene have been in fair demand as has also petroleum jelly. There has been the usual steady demand over the normal range of industrial chemicals and deliveries against orders for most materials have been reasonably prompt. In the export market there has been a tendency for prices to increase, due to the rise in cost of packaging. Inquiries have been on a fair scale, but chiefly for chemicals which are not available. Offers of caustic soda at fantastic prices have been reported from several sources,

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Method of producing thiolactams.—Bata, Narodni Podnik. November 16, 1942. 16843-44/1947.

Process for preparing hydroxylaminosulphonate solutions.—Bata, Narodni Podnik. November 25, 1943. 16845/1947.

Resinous compositions comprising amino-formaldehyde condensation products.—British Industrial Plastics, Ltd. January 12, 1946. 37586/1946.

Processes for the production of riboflavin. —Commercial Solvents Corporation. March 16, 1942. 16418-19/1947.

Processes for the recovery of riboflavin.—Commercial Solvents Corporation. May 28, 1943. 16420-21/1947.

Process of removing hydrogen sulphide from hydrocarbon liquids.—Girdler Corporation. March 12, 1943. 16702/1947.

Esters of beta-halo carboxylic acids and methods of preparing same.—B. F. Goodrich Co. October 5, 1945. 26440/1946.

Coating compositions.—I.C.I., Ltd. November 25, 1944. 31827/1945.

Device for producing toxic vapours.—I.C.I., Ltd. September 11, 1945. 27291/1946.

Quaternary ammonium halides and methods for obtaining the same.—Parke, Davis, & Co. January 11, 1946. 8033/1946.

Quaternary ammonium halides and methods for obtaining the same.—Parke, Davis, & Co. January 11, 1946. 8034/1946.

Quaternary ammonium compounds and methods for obtaining same.—Parke, Davis, & Co. January 11, 1946. 8035/46.

Method and means for self agglomeration. —Soc. Chimique de la Grande Paroisse Azote & Produits Chimiques. January 9, 1946. 38154/1946.

Processes for the recovery or regeneration of waste sulphuric acid and mixtures containing same.—Spilek Pro Chemickou a Hutni Vyrobu. October 26, 1940. 16821/1947.

Processes for the recovery or regeneration of waste sulphuric acid and mixtures containing the same.—Spolek pro Chemickou a Hutni Vyrobu. September 29, 1943. 17079/1947.

Processes for the recovery or regeneration of waste sulphuric acid and mixtures containing the same.—Spolek pro Chemickou a Hutni Vyrobu. October 9, 1944. 17220/1947.

Contacting finely divided solids and gaseous fluids. Standard Oil Development Co. September 12, 1941. 15307/1942.

Improvements in the conversion of fluid reactants in the presence of subdivided solid catalyst particles.—Universal Oil Products Co. September 29, 1945. 15920-21/1947.

Alkylation of paraffin hydrocarbons.—Universal Oil Products Co. December 31, 1938. 16880/1947.

Purified antibiotics and process of obtaining same.—Wyeth, Inc. January 9, 1946 36980/1946.

Preparation of substituted *N*—(Aromatic (b) pyrazmethyl) aminophenyl compounds and intermediates thereof.—American Cyanamid Co. January 15, 1946. 13481-82/1946.

Resinous compositions.—American Cyanamid Co. January 19, 1946. 32660-61/1946.

Carbonisation of coking coals.—American Cyanamid Co. January 16, 1946. 643/1947.

Reduction of organic compounds.—British Celanese, Ltd. September 27, 1945. 28238/1946.

High clarity cellulose esters.—British Celanese, Ltd. January 17, 1946. 37531/1946.

Preparation of tetrahalogenated benzenes and benzoic acids.—British Celanese, Ltd. January 1', 1946. 1288/1947.

Plasticised polyvinyl halide resins.—British Thomson-Houston Co., Ltd. January 15, 1946. 1289/1947.

Plasticised polyvinyl chloride.—British Thomson-Houston Co., Ltd. January 15, 1946. 1403/1947.

Organo - dihalogenosiloxanes. — British Thomson-Houston Co., Ltd. October 29, 1942. 17564/1947.

Manufacture of nitrogen compounds.—Ciba, Ltd. October 26, 1945. 29108/46.

Process for improving textile sheet materials of glass fibres.—Ciba, Ltd. January 18, 1946. 1501/1947.

Processes for the preparation of olefinic alcohols from the corresponding acetylenic alcohols.—Commercial Solvents Corporation. August 14, 1943. 25908/44.

Process for the lamination of plastic sheet material.—E.I. Du Pont de Nemours & Co. April 22, 1943. 27292/1946.

Hydrolysed interpolymers of vinyl fluoride with vinyl esters.—E.I. Du Pont de Nemours & Co. September 21, 1945. 28414/1946.

Process for the manufacture of chromium salts, chromates, bichromates and pure chromium.—P. Guareschi. January 16, 1946. 1505/1947.

Process for the manufacture of oleum.—P. Guareschi. January 16, 1946. 1506/1947.

Chemical compounds and processes of preparing the same.—Merck & Co., Inc. January 18, 1946. 1309/1947.

The Chemical Age

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BOUVERIE HOUSE, 154 FLEET STREET, LONDON, E.C.4

Telegrams: ALLANGAS FLEET LONDON Telephone: CENTRAL 3212 (16 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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Bunk or Common Sense?

INCENTIVES to work are commonly regarded as desirable for everyone, and a necessity for most people. The student who works to pass his examination does so partly because there lies before him the incentive to pass, to achieve something, but ultimately because success may open the way to a career. The young man starting in industry does not do so because he likes work—there are some who do, but they are not typical of the species—but because through work he hopes to win a competence and perhaps a fortune. If there be those who doubt it, we will recount for their edification a story concerning a successful and prosperous man who started life in the coal mines. What induced you, we asked him, to enter the mines. His reply was that in his youth some mining men had rented his father's house for holiday and on returning the youth had explored the outhouses and had there found dozens of empty champagne bottles (this was before 1914). The thought had immediately struck his immature mind that here certainly was evidence that coal mining was a highly lucrative business. Fired by this incentive he had taken his mine manager's certificate and launched himself on a mining career. That he subsequently abandoned mining was due to the incentive not being great enough after the 1914-18 war.

Coming down the social scale, we would ask what makes the working man work? He does not in general do it for fun. He has worked in the past because otherwise he could not earn enough to keep himself and his family. Whatever makes life worth living in so-called civilised countries can only be got by giving to the community services in exchange—i.e. by earning wages. Once upon a time, there was also the incentive to earn as much as possible because one could buy luxuries with what one earned. The greater the amount of work done, the more of whatever was available from the common stock could be bought with the proceeds. On the other hand, if one did not work, one could get nothing, and if one did not work well, one got the sack. Thus, under what is described as "the bad old system of capitalism," a man had two incentives to work, one in front drawing him forward with the promise of reward; the other behind urging his feet onward with the wings of fear—fear of the sack and unemployment. Under these conditions of double incentive, the British working man did a good day's work for his pay. True, his pay was not always as high as it might have been, but at least the system worked, even though at times of bad trade there was much unemployment.

Lured by promises of political orators, the British working man has come to believe that there is untold gold locked up in the bank accounts of a few fortunate individuals, and that anyway "The State" has a bottomless purse. He has been encouraged to believe that it is possible for an earthly paradise to be set up in Britain in which the adoption of shorter working hours will prevent unemployment, while wages can go up and up to provide the highest standards of life for everyone. In consequence there is a total lack of the will to work, low output, and considerable "sales resistance" to any talk of the need

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for getting back to the old standards of hard work and hard living.

Nor is this confined to the working man. There are in high places, though perhaps for other reasons, those who show themselves to possess much the same spirit. Nationalisation is responsible for a great deal of this spirit. A nationalised industry consists of a great many individuals who have only one "boss" and no other outlet for their services, for they have no other experience. At all costs it is necessary for these men that they do not get themselves dismissed from their posts. They are, moreover, in competition with others for yet higher posts. The one thing that they must not do is to make a mistake. Better do nothing than do something wrong. This is the antithesis to private enterprise and it is killing nationalised industries. The Coal Board, for example, has been in operation nearly nine months. What has it accomplished? Reduction in output, widespread dissatisfaction, no improvement in coal quality, strikes and trade disputes, and now a considerable increase in the cost of coal. The Coal Board can only justify nationalisation by reducing the cost of getting coal and of supplying it to the public. So far from doing so it is finding it easy to do nothing but to pass on to the rest of the country the cost of doing nothing. The serious handicap that the increased cost of coal, and therefore of all fuel and power, will place upon British industry is self-evident. Our pithead cost of coal is about 42s. a ton. The U.S.A. pithead cost is about 14s. How can we compete? Why is there this apathy? Is it not because from the bottom right up to the top, though for different reasons at different levels, there is no incentive to do better while there is every incentive to do nothing?

Yet Mr. Morrison in a recent political broadcast said: "People talk a lot about what they call incentives. For myself I believe that a lot of this talk is bunk." The past history of the country no less than its present history suggests that while there will always be a certain number of people, amongst whom are to be numbered many pure scientists, who will work hard and give of their best because of the joy of achievement, most of us must have incentives to do so. To some the incentive may be the desire for fame, but to most it is the fear of the consequences of not doing the job to the best of one's ability and the anticipation of future reward for doing a job well. The economic system of the country has been allowed to get into such a condition that the ordinary incentives either do not exist or operate against a Government policy instead of with it. Is not one of the most urgent tasks of the Government today to remove the causes of this conflict? Mr. F. W. Paish in the latest review of the Westminster Bank has pointed out that many of the present frictions and frustrations are due to the fact that although many incentives continue to operate in greater or lesser degree they frequently pull in opposite directions: "Profitable transactions which before the war would have been both legal and generally regarded as socially desirable, are now often contrary to the law; while many of those that are still allowed can be carried out only after long and difficult negotiations, often with several separate and imperfectly co-ordinated departments . . . Because the public gets its necessaries cheaply, it has more money to spare for expenditure on less essential requirements." We shall not follow Mr. Paish in his analysis of the general causes of the non-functioning of incentives. Is it not a fact, however, that there is little incentive to-day for the manufacturer to engage in new ventures involving enterprise and initiative, for he is largely prevented from doing so by controls and official inaction? The old incentives which caused the individual to give of his best have largely disappeared. Until these incentives return and the nation gets back to a system in which enterprise is rewarded we shall not see much improvement in the present situation.

NOTES AND COMMENTS

BECAUSE of the recently concluded International Congress of Chemistry, there were fewer papers than usual of interest to the heavy chemical industry at the British Association meeting at Dundee which finished last week. But on topics in the fine chemicals field and on subjects of direct and indirect interest to the chemical industry, there was plenty of discussion. For instance, penicillin and other antibiotics was fully discussed, and in this subject interest will grow in view of the announcement this week by the Ministry of Health that the preliminary trials of streptomycin, organised by the Medical Research Council, have proved sufficiently encouraging for it to be used for certain treatment. In view of some of the damning reports which came from America soon after the first flush of enthusiasm for this new drug had worn off, the news that the trials were not entirely negative is hopeful. Another discussion of interest to chemists was that on insecticides, where the problem of the place of insecticides in agriculture and food production gave rise to several interesting papers.

Isotope Future

A JOINT discussion, with the Physiology Section, on "The Use of Tracer Elements, Stable and Radio-active, in Biology and Chemistry" showed, as a recent dispatch from our New York Correspondent also intimated (CHEMICAL AGE, August 23), that radio-active isotopes have a big future before them as a research tool. In his report our correspondent gave several industrial research uses to which they are put already. The American Government has now agreed to allow the export of many groups of these substances. This news, which is very welcome indeed, will relieve the anxieties of many research workers who are awaiting supplies of these tracer elements which they could not possibly obtain in the near future from British sources.

New Coal Mines

ANOTHER interesting topic was the coal problem, which was discussed fully in the Geology Section. Questions ranging from the environment of the miner to the possibility of finding new coalfields came under review. In this latter connection it was interesting to find out from Dr. G. M. Lees that much exploration work is going on in several areas to find possible new coalfields. As a result of these explorations, one coalfield has been discovered in Central Lincolnshire, but it is, alas, too deep for present-day exploitation. This exploration work is obviously a long-term policy, as we have, so far as we can see, not enough miners to deal with our present coal mines.

Scapegoats

ONE evening while we were at Dundee, (it was a Sunday evening, and the typical Scottish sabbath was in full sombre progress) we spent some little time in the City Square listening to Mr. Strachey, the Minister of Food. The proposed food cuts, foreign travel cuts and basic petrol ration cuts had just been announced and were uppermost in the minds of most people, so Mr. Strachey was not able to evade talking about them. Although we were not prepared for any statesmanlike speech, we were appalled by what he did say. There was no defence of the food cuts. And the principal thing he had to say to the worker was "You may be badly off, but Lord, you should see what we've done to the middle class." It was a frankly class-warfare speech at its worst.

Speaking down to his predominantly working-class audience—and sometimes down to child level—he tried to mollify the Dundee men and women and take the edge off the food cuts by telling them that although they had suffered, the Government had made the middle-class, who would always be the first victims in any new austerity drive, suffer more. The Labour Party have often denied that they preach class warfare. For this claim to be true they must sit on some of their Ministers who, like Hitler, when in a hole "go for" the middle class and the so-called capitalists.

Ineptitude

THIS same class warfare is evident in the treatment, or lack of treatment, of the disgraceful Grimethorpe strike which is holding up production of coal, causing widespread unemployment, and affecting the chemical industry directly by fuel shortages. In this strike about 100 obstinate (or perhaps it may be "politically conscious") men, together with thousands of "sympathetic" strikers, have stopped the output of thousands of tons of coal since August 12. The authorities are treating them in a manner in which nervousness, apathy and tolerance are curiously combined, and which tells the men more clearly than words that the authorities are just going to let the strike drift on. They are clearly not going to take drastic action. The latest suggestion for ending the dispute comes from Mr. Horner, who has told the striking miners that they will not really have to work the longer stint if they go back to work while the proposed committee of inquiry, which he proposes, is preparing its report, because there is so much clearing up, etc., to be done that the report will be out before the miners have to work the extra two feet of coal-face. If this is put forward officially it will be a shameful retreat by the authorities. An ironic fact about this dispute is that the strikers are now accusing the "horde of bureaucrats" of being responsible for the trouble. How long since is it that they were clamouring for nationalisation of the mines? It does occur to us to wonder whether this kid-glove method of treatment would have been meted out to private employers had they dared to hold up the production of a vital essential commodity in these days. We have no doubt at all that any such hold up would soon have been broken.

Production Halted

AS a result of this strike unemployment is spreading throughout many industries. About 50 smelting furnaces in Sheffield's steelworks have closed with a loss of steel up to date of 15,000 tons. By the end of this week thousands of steel workers will be out of work or on short time. In the glass industry the shortage of coal has been felt too. Two glass bottle manufacturers near Pontefract have been closed indefinitely and another glass firm has given notice to close soon. Future coal production, too, will be affected as the production of coal-mining machinery will also be seriously affected. Severe gas cuts have already affected many areas of Yorkshire and may soon extend to other parts of the country.

Domination by a Few

ONE way in which a strike of this sort could be settled peacefully is to have a written and secret ballot of the men as to whether they wish to continue the strike or not. At present meetings are held and a show of hands taken to decide whether or not they shall stay on strike. It is obvious that the men sometimes vote for continuance of the strike out of fear of what may happen to them if they vote to go back or else from a feeling of not wanting to let their mates down, as they think, when in fact a majority are in favour of going back to work. Another point is that only a small percentage of the miners attend these meetings. A secret ballot by all the miners on the question of the resumption of work should be taken. We think a majority would then vote to go back. But if not, and they continue in their obduracy, then the Government should take drastic acton to put an end to this dispute which is endangering the whole of the country's economy.

U.S. to Control Steel Exports

The U.S. Government is to re-impose a strict control over steel imports as from October 1 next, from which date onwards licences to export will be issued only on individual orders, and there will be limits to the amount of steel a country may receive. Licences, which will be issued on an overall tonnage basis, will affect shipments of pig iron, iron and steel scrap, sheet steel and boiler plate. It is understood, however, that priority will be given to cargoes intended for reconstruction and basic industries overseas.

More Chemical Workers

THE steady increase in employment in the chemical industry is again reflected in the summary for June contained in the August issue of the Monthly Digest of Statistics, published by the Central Statistical Office (H.M.S.O., 2s. 6d. net).

In June 351,000 were employed in manufacturing chemicals, explosives, paints, oils, etc., as compared with 349,600 in May and 335,800 in June a year ago. The figures indicate incidentally the increasing employment of men and the smaller proportion of women, of the latter there being 118,100 on the labour strength in June, against 121,300 a year ago. The new grand total is substantially the largest since the need for large output from the Government explosives factories ended in June, 1945.

A record of production, use and stocks of non-ferrous metals and chemicals in June and in June 1946 is provided in the following table:—

	June, 1947 Thousand tons			June, 1946 Thousand tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Refined lead		16.9	22.3		16.4	33.7
Tin metal		2.18	15		1.92	22.4
Virgin aluminium	2.23	13.3		2.25	7.9	
Magnesium	0.21	0.63		0.12	0.20	
Virgin copper...		31.1	102.3		23.7	80.9
Virgin zinc		19.2	26		17.1	78.2
Molasses	10.1	*31.8	124.1	7.6	*22.9	178
Industrial alcohol†	2.08	2.45	4.61	1.50	2.13	2.33
Sulphuric acid	110.0	111	66.8	112.9	106	64.9
Pyrites		14.3	84		17.2	88
Sulphur (for acid)		18.3	69.2		17	58.1
Spent oxide		14	149.7		15.6	139
Superphosphate	80.9	60.2	99.7	75.1	64.8	66.7
Compound fertilisers	76	29.1	89.6	80.9	18.1	116.6
Ammonia		31.28	3.28		25.51	3.11
Phosphate rock		60.1	141.1		50.2	153.8
Phosphate rock (for industry) ...		5.40	33		4.41	15

*For distilling. † In million bulk gallons

WORLD OIL SHORTAGE

LEVER'S CHAIRMAN REVIEWS THE PROSPECTS

AN authoritative review of the current world condition of shortage of oils and fats and of means of relieving it was given by Mr. Geoffrey Heyworth, presiding this week at the annual general meeting of Lever Brothers and Unilever, Ltd.

"In all," he said, "I estimate that the 1947 world production of oils and fats is about 2,500,000 tons per annum below the pre-war figure of nearly 20,000,000 tons. If one takes into account the fact that the population of the world must have increased by about 8 per cent since 1939, which would mean an additional requirement of 1,500,000 tons per annum, the total deficit compared with pre-war quantities amounts to about 4,000,000 tons."

More Whale Oil

Among the measures which he recommended to alleviate the shortage was the temporary suspension as an emergency measure of the international agreement limiting the taking of whales, which this year restricted whale oil production to 320,000 tons, as compared with the 500,000 tons taken in a season pre-war. Other measures he mentioned were the ending by co-operation of the competitive buying by European countries which had resulted in this country paying for 10 per cent of its oils, excluding linseed, three times as much as for the remaining 90 per cent, the granting of larger export allocations by the United States and the Philippines, and additional production by the extension of such enterprises as the East African groundnut scheme and the increased use of mineral oils as detergents.

Japan's Chemical Needs

CHEMICALS and allied materials and some metals predominate among the commodities which Japan is anxious to import. The Board of Trade, publishing a list of requirements for which Tokyo is seeking supplies, emphasises that the majority of the commodities are still subject to overriding U.K. export restrictions and that no exception will be made for supplies to Japan.

The list of urgent requirements includes the following: Rubber, paraffin wax (all grades), carbon black, lead, fats and oils, copra, silicon steels (sheets), pig iron, animal glue, crushed bones, sinews and fleshings, magnesia clinkers, graphite, mica, lacquer (natural), soda ash, caustic soda, shellac, tin plate, furnace fuel oil, dyes (acid, basic, direct chrome), rosin, bauxite, tungsten concentrate, rayon pulp.

STAGGERED HOURS IN FACTORIES

Relaxation of Restrictions

IN order to facilitate the spreading of the electricity load by means of staggered hours of work in factories, the Minister of Labour and National Service has made a new Order entitled the Factories (Hours of Employment in Factories, using Electricity) Order, 1947.* The Order allows conditional exemption from some of the provisions of the Factories Act, 1937, which restrict the hours of employment of women and of young persons under the age of 18. The Order applies to factories in which the electricity generated outside is used for any purpose other than lighting or ventilating the workrooms or other parts of the factory.

Certificates

The Order comes into force on September 22, but a factory occupier may not avail himself of any of the relaxations that it allows unless he first obtains permission from the District Inspector of Factories, who will issue a certificate to that effect. Before granting a certificate the District Inspector will take into account any scheme or proposal made by the Regional Board for Industry, together with the views of the appropriate local trade union representatives with the object of spreading the electricity load.

Certificates issued by a District Inspector may permit the following relaxations:—

(*A*) *Day Work.*

(1) Employment may begin at 6 a.m. (instead of 7 a.m.) for persons aged 16 or over, or, alternatively,

(2) Except on the weekly short day, the period of employment may end at 11 p.m. (instead of 8 p.m.) for persons aged 16 or over, and at 6.30 p.m. (instead of 6 p.m.) for those under 16, or, alternatively,

(3) The women and young persons may be divided into two sets, in which case the period of employment may begin as in (1) above for the first set and may end as in (2) above for the second set.

(*B*) *Meals and Intervals.*

The periods of employment and intervals for meals and rest may differ from week to week, but where this is permitted the total working hours for persons aged 16 or over may be more than 48 in a week (but not more than a number specified by the District Inspector), provided that they do not average more than 48 a week over two consecutive weeks or over a period which appears reasonable to the Inspector.

(*C*) *Afternoon Spell.*

Where a period of employment ends not later than 7.15 p.m., an afternoon spell of work may be as long as six hours, provided there is a break of at least a quarter of an hour during the spell and the District Inspector is satisfied with the arrangements for refreshment during the break.

(*D*) *Saturday Afternoon or Sunday.*

Work may be allowed provided another day is substituted as the weekly short day or day of rest as the case may be.

(*E*) *Night Work.*

This may be permitted (for women aged 18 or over and *male* young persons aged 16 or over) subject to the following limitations:

(a) not more than six nights in a week;

(b) maximum of 48 hours work a week and nine hours work a night (or ten hours a night if only five nights a week are worked;

(c) period of employment not to exceed 11 hours (or 12 hours if only five nights a week are worked) on any night, and

(d) not to begin before 7 p.m. or end after 8 a.m.

The Order therefore allows a very wide variety of arrangements for staggering hours of work. It will be possible under the Order for District Inspectors of Factories, in appropriate cases, to permit double day shift working by women and young persons *aged 16 or over*, and day and night shift working or three-shift working by women aged 18 or over and *male* young persons aged 16 or over.

Safety Provisions Retained

The Order in no way modifies the safety, health and welfare provisions of the 1937 Act and, except insofar as a certificate of permission issued by a District Inspector of Factories authorises it. The provisions of the Act relating to the hours of work of women and young persons (including the special exceptions provided for in the Act) will continue in force.

It is emphasised that the Order makes no provision for employment of young persons under the age of 16 before 7 a.m. or after 6.30 p.m.: employment of female young persons aged 16 to 18 before 6 a.m. or after 11 p.m., or hours of work of an individual worker to be spread over longer periods of employment than those laid down by the Factories Act, 1937.

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* S.R. & O, 1947, No. 1870 ; published by H.M. Stationary Office. Price : 2d. net ; post free 3d.

Atomic Energy Rail Exhibition

As briefly mentioned in last week's CHEMICAL AGE, the Atomic Scientists' Association, with full co-operation of the Ministry of Supply, is organising a travelling train Exhibition on Atomic Energy which will start at the beginning of November, touring 26 towns in England, Scotland and Wales. The aim of the exhibition will be to give the public the basic facts of atomic energy and explain its implications; its destructive and constructive purposes. The exhibition will be fitted in two coaches.

The first half of the exhibition will deal with the basic principles of atomic energy. These will be illustrated by means of charts, photographs and working models. But, in addition to these, there will be several experiments showing the instruments used by scientists in laboratories for the detection of radio-activity, and the process of splitting uranium atoms. There will also be an experiment showing the production of artificial radio-activity.

In the second part, the application of atomic energy will be shown with models illustrating the chain reaction in uranium, the principles of separation of isotopes and atomic energy piles. The applications of atomic energy to medicine and biological sciences will also be illustrated. The instruments used in the Tracer technique in medicine will be shown.

Chester First

Scientists will be in attendance to answer questions and to give additional explanations. It is planned to organise, at the same time, Atomic Energy Weeks in each town visited, when lectures and film shows will take place. There will be, in collaboration with various local organisations, public meetings, "brain trusts" and conducted parties for schools, etc.

The choice of towns to be visited was dictated largely by train requirements and existing facilities at the various stations. These facts have eliminated a number of towns which were intended to be fitted into the itinerary. The official opening will take place at Liverpool, but the first showing to the public will be at Chester.

The itinerary for the Atomic Energy Exhibition train is as follows:—

November 10-13, L.M.S. Station, Chester, four days; November 14-18, L.M.S. Station, Stoke-on-Trent, five days; November 19-27, L.M.S. Victoria Station, Manchester, nine days; November 29-December 6, L.M.S. Central Station, Blackpool, eight days; December 8-10, L.M.S. Station, Carlisle, three days; December 12-20, L.M.S. St. Enoch Station, Glasgow, nine days; December 22-24, L.M.S. West Station, Dundee, three days; December 29-31, L.N.E. Central Station, Leith, three days.

January 2-6, L.N.E. Waverley Station, Edinburgh, five days; January 8-12, L.N.E. Central Station, Newcastle-on-Tyne, five days; January 14-17, L.N.E. Station, Middlesbrough, four days; January 19-22, L.N.E. Station, York, four days; January 23-28, L.M.S. City South Station, Leeds, six days; January 29-February 3, L.M.S. Station, Sheffield, six days; February 5-7, L.M.S. Station, Derby, three days; February 9-12, L.M.S. Station, Coventry, four days; February 13-17, L.N.E. Victoria Station, Nottingham, five days; February 18-21, L.N.E. Central Station, Leicester, four days; February 23-March 2, G.W. Snow Hill Station, Birmingham, nine days.

March 4-6, G.W. Station, Shrewsbury, three days; March 8-13, G.W. High Street Station, Swansea, six days; March 15-20, G.W. Temple Meads Station, Bristol, six days; March 22-27, G.W. Queen Street Station, Cardiff, six days; March 29-April 3, L.M.S. Station, Oxford, six days; April 5-8, S.R. Station, Reading, four days; April 9-20, G.W. Paddington Station, London, 12 days.

American Wax Shortage

MANUFACTURING chemists in Scotland are currently worried over the prospect that the American dollar situation may lead to a reduction in the supplies of certain raw materials available to the industry. A particular instance of this is that of one Scottish manufacturer who pointed to the virtual elimination of many polishes if American sources of waxes are cut out or controlled by Government action. It is understood that discussions are proceeding between users and the Government departments involved to attempt a continuity of supplies, but there is no optimism that the industry will escape unscathed during the present curtailment of buying. According to this manufacturer, the limitation of wax supplies would lead to a situation whereby most polishes would be gradually forced off the market. It would be possible to continue liquid and semi-liquid varieties for some considerable time, but even there some deterioration of supplies is inevitable. For the same reason manufacturers foresee a very definite limitation to new developments in the meantime, pending the improvement of the dollar position and some clarification as to supplies and sources of supplies. The situation is more serious in some directions than in others, but all manufacturers drawing supplies from American sources anticipate certain difficulties.

PAINT RESEARCH ASSOCIATION

TO commemorate the 21st anniversary of the foundation of the Research Association of British Paint, Colour and Varnish Manufacturers, an "Open Week" and Exhibition is being held at the Paint Research Station, during the course of which extensions to the present buildings will be formally opened by Sir Edward Appleton in the presence of distinguished visitors. Proceedings commence on September 23 and will last for four days. The programme is as follows:—

Tuesday (September 23) at Teddington*

2.30 p.m., Assembly. 2.45 p.m., Opening of the extensions by Sir Edward Appleton. 3.30 p.m., Address by Prof. H. V. A. Briscoe entitled "Following the Unexpected." 4.15 p.m., Tea.

Wednesday (September 24) in London.

12.15 p.m., Reception. 12.30 p.m., Luncheon at the Connaught Rooms. The Rt. Hon. Col. Walter Elliott will propose the toast of the Research Association.

(At Teddington.)

4.15 p.m., Tea. 2 p.m. to 6 p.m., Laboratories open for visitors.

Thursday (September 25) at Teddington.*

2 p.m., Assembly. 2.30 p.m., Address: Sir Thomas Merton. 3 p.m., Lecture: "Is Copal Varnish an Alkyd?" by Dr. D. A. Sutton. 4.15 p.m., Tea.

Friday (September 26) at Teddington.*

2 p.m., Assembly. 2.30 p.m., Chairman: Sir Charles Darwin, Director, N.P.L. Address: Sir Lawrence Bragg. 3 p.m., Lecture: "Paint and Mathematics," by Dr. G. Herdan. 4.15 p.m., Tea.

* The exhibition will be open these days until 6 p.m.

R.I.C. QUESTIONNAIRE

New Register of Fellows

IN response to numerous requests from members, Government Departments and others, the Council of the Royal Institute of Chemistry decided over a year ago to prepare a new Register of Fellows and Associates as soon as the necessary supplies of paper and printing facilities became available. Such a position may be reached during the next few months and preparations have therefore been made to issue all Fellows and Associates with a form on which they may report up-to-date particulars of themselves for inclusion in this Register. The form will be returnable to the Institute as a pre-paid postcard, and the Institute intends to forward these postcards to the printer after any necessary editorial amendment.

The Council has further decided to ask members to make a return of their remunerations. The information provided in 1942 when 72 per cent of Fellows and Associates resident in Great Britain responded to a similar request, has proved of considerable value to members, both in their capacities as employees and as employers, and has, moreover, been of equal value to the Institute when dealing with matters of economic status. During the next few months, subject to paper being available, the Institute hopes to send all Fellows and Associates a circular letter and pre-paid postcard form on which this information may be furnished anonymously. Fellows and Associates will be asked to study the instructions carefully, before replying, in order that the statistical information may be fully representative.

Coal Strike Halts Industries

A LOSS of some 15,000 tons of steel was reported early this week from Sheffield as a result of the strike in the South Yorkshire coal pits and the consequent reduction of coal supplies.

The managing director of Hadfields, one of Sheffield's largest steel manufacturers employing 5000, said last week-end: "Thousands will be out of work or on short time in a few days if the pit strike is not ended. Before the strike began my firm had two weeks' supply of coal in hand for the winter. Now we have enough for a few days only." Even if the pit dispute ends soon, short-time working in some industries would be inevitable.

As a direct result of the strike, supplies to industrial gas users are being cut to 30 per cent of normal. Two glass bottle manufacturers at Knottingley have been obliged to close and others are likely to do so.

Lever Brothers' Pension Scheme

Lever Brothers and Unilever, Ltd., have announced a new pension scheme embracing the works employees of the two companies, together with those of the following subsidiaries: Van den Berghs and Jurgens, Ltd.; Stork Margarine Works; Prices (Bromborough), Ltd.; and Joseph Crosfield and Sons, Ltd., Warrington. The fund, which replaces an existing provident fund, will confer benefits additional to those of the State insurance plan.

Retirement pensions are payable at 65, while provision is made for widows' and children's pensions. Widows' pensions will be one-half of the full retirement pay of the subscribing member. There will also be dependent pensions in special circumstances. Contributions will be paid jointly by the employee and company, about one-third of the cost being met by the former.

PROPERTIES OF CONCRETE

Report on Ingredients

A TECHNICAL report, for which there has been considerable demand by engineers engaged on concrete construction, is republished today. "Road Research Technical Paper No. 5—The Grading of Aggregates and the Workability of Concrete" (H.M.S.O. Kingsway, London, W.C.2, price 1s. 6d., by post 1s. 8d.) was first published in 1938 but has now been enlarged and slightly amended.

The report describes an investigation into the effect of the ingredients on the properties of concrete; it deals especially with the relations between mix proportions, aggregate shape and grading, and workability. The main part consists of an examination of the effects of the shape and grading of the aggregate and of the mix proportions on the workability of concrete and much valuable data to help engineers in the choice of mix proportions is given. It is shown that while the water-cement ratio is the chief factor that determines the strength of concrete, the water-cement ratio in a given mix is itself largely determined by the grading and type of the aggregate used.

Workability is more precisely defined in this report and is regarded as a property of the concrete alone. A description is given of a method of measuring workability, called the compacting factor test, which overcomes some of the limitations of the slump test.

For the practising engineer the paper provides a good background of knowledge on designing concrete mixes having specified properties. This subject will, however, be dealt with more fully in "Road Note No. 4—The Design of Concrete Mixes," which will be published in two to three months' time.

Electron Jubilee

The Institute of Physics and the Physical Society in collaboration with the Institution of Electrical Engineers is arranging a series of lectures and other functions in London on September 25 and 26 next, to mark the jubilee of the discovery of the electron by J. J. Thomson, while industrial organisations and universities have collaborated with the authorities at the Science Museum, South Kensington in arranging a special exhibition, which will remain open for about three months. The exhibition is designed to show the principles underlying the applications of the many devices in which the electron plays an essential part, and to help the visitor to appreciate the important part these developments play in his daily activities. The exhibits will range from Thomson's original apparatus to the most modern developments, such as the electron microscope; many will be working.

SPEKE PENICILLIN FACTORY

Future Assured

WITH the announcement on September 1 that the penicillin factory at Speke, Liverpool, is to be handed over by the Ministry of Supply to the Distillers' Company, Ltd., on December 1, the future of the factory as the world's largest producer of the drug seems assured.

Its importance will be increased when the Distillers' Company complete the setting-up of a pilot plant for the manufacture of another new drug, streptomycin, the manufacture of which has certain similarities to the manufacture of penicillin.

The Speke factory was constructed by the Ministry of Supply at a cost of £1,125,000 and began production late in 1945. It covers twelve acres and employs nearly 400 people. It has been operated by the Distillers' Company on behalf of the Ministry of Supply.

As far as the production of penicillin is concerned, the Distillers' Company proposes to develop this even further on a commercial basis, maintaining the factory as the principal centre of manufacture for home and export purposes. Output will be increased as much as is possible.

Independent of the Ministry of Supply, the Distillers' Company is setting up a pilot plant for the manufacture of streptomycin, on which clinical tests are now being made as to its efficacy as a meningitis and tuberculosis cure. This plant may be in use by the end of the year.

In January, 1946, 10,000 million units of penicillin were prepared, bottled and tested. Output was trebled a month later, and it is believed that the production rate now exceeds 80,000 million units a month.

Dufay-Chromex and I.C.I.

It is reported that negotiations are in progress between Dufay-Chromex (manufacturers of colour films and cellulose acetate sheeting) and I.C.I. As far as can be judged from observations made by the chairman of the former company at its recent ordinary general meeting, there is no question either of amalgamation or joint endeavours in the commercial field. It is significant, however, that the chairman has remarked that I.C.I. "have one of the most advanced technical staffs in the world," which may well indicate that Dufay-Chromex is anxious to "borrow" I.C.I. technicians possibly with a view to undertaking research work of value to both parties. An I.C.I. representative, when approached by THE CHEMICAL AGE, agreed that conversations were taking place, but declined to disclose their purpose.

OFFICIAL NOTICES

Penicillin Control Removed

CONSEQUENT upon the operation of the Penicillin Act, 1947, on July 18, and the Therapeutic Substances Amendment Regulations, 1947, on August 18, the Minister of Supply has made the Control of Penicillin (No. 3) (Revocation) Order, 1947 (S.R. & O. 1947, No. 1831). This Order, which is effective from August 30, frees penicillin and penicillin preparations from control by the Minister of Supply. As from August 30, 1947, licences granted under the Control of Penicillin (Nos. 1 and 2) Orders, 1946, cease to have effect.

Free Disposal of Magnesium

The Minister of Supply has made an Order (The Control of Magnesium (No. 5) (Revocation) Order, 1947) revoking the Control of Magnesium (No. 4) Order, 1942. The effect of the revocation, which came into force on September 1, is to free the acquisition, disposal, and use of all forms of magnesium and magnesium alloys from licensing and to remove price control.

Gum and Wood Resin

The Board of Trade announces that on and after September 1, 1947, the selling prices of gum and wood resin sold by them through their agents, the United Kingdom Naval Stores Association, Ltd., 46 St. Mary Axe, London, E.C.3, will be reduced as follows:—

Gum Resin	*Per cwt., ex store*	*Wood Resin*	*Per cwt.' ex store*
Medium pale	56/-	B	40/6
B, D, E	56/-	FF	47/-
F/M	59/-	K, M	56/-
N, WG	60/-	N, WG	57/-
WW	61/-	WW	58/-
WWX, Y	61/6	Vinsol	48/-
2A, 3A, 4A, 5A	62/-	Polymerised resin	65/6
Crystal	62/6		

Benzene Duty Exemption

The Treasury has made an Order exempting iso-propyl-benzene (cumene, cumol) from Key Industry Duty for the period beginning September 3 last and ending December 31 next. The Order is entitled "The Safeguarding of Industries" (Exemption) (No. 5) Order, 1947 (S.R. & O. 1947, No. 1848), and is obtainable, price 1d., from H.M. Stationery Office.

Control of Iron and Steel

The Ministry of Supply Control of Iron and Steel (No. 59) Order which came into force on September 3, increases maximum prices of rainwater and soil goods, roping wire and wire ropes. Maximum prices for extra light weight quality screwed and socketted tubing are also established.

CHLORINE LORRY ON FIRE

A LORRY and trailer with a consignment of liquid chlorine in drums and cylinders, said to be bound from Chester to Kentish Town, caught fire on the Barnet by-pass last week. Three local sections of the National Fire Service were called to the scene, and traffic was held up for about half an hour until the fire was brought under control. Although the driver and his mate managed to detach the trailer before the arrival of the N.F.S., and thus prevent the fire from spreading, some of the smaller drums on the lorry burst owing to the heat. The chlorine thus released rendered the firefighters' task more difficult. Special breathing apparatus had to be sent for when a fireman succumbed to the fumes. He was taken to hospital, but was allowed to leave after treatment.

Reports state that the lorry was completely gutted, though some of the larger drums of chlorine resisted the flames and were subsequently salvaged. It is understood that the consignment was destined for a Kentish Town I.C.I. depot, which sent a break-down team to retrieve the trailer and its contents.

Coal Slumps Again

A REDUCTION of approximately 200,000 tons by comparison with the same period of 1946 is revealed by the Ministry of Fuel statement on Tuesday of weekly coal output in the previous week. The total of saleable coal from the mines was 3,414,200 tons. The relatively small output of opencast coal again improved to 224,100 tons, against 201,700 tons a year ago. The combined totals, 3,638,300 tons, was 361,700 tons below the Government's weekly target of 4 million. Of this 247,550 tons were lost by the widespread strikes in the Yorkshire pits, where on Tuesday 15 or the 47 idle pits elected to return to work.

Cass Technical Institute

Chemical Courses in 1947-48 Session

Afternoon and evening courses arranged by the Sir John Cass Technical Institute for its 1947-48 session include the following: "Chemicals from Petroleum," by Dr. M. A. Matthews; "Industrial Law," by Mr. Eric Walker; "Advanced Organic Chemistry," by Mr. A. G. Lidstone; "General Technology of Petroleum" (various lecturers); "Patents and Industrial Design Protection," by Mr. Eric Walker; "Spectroscopic Analysis," by Dr. S. Judd Lewis and Dr. D. W. Wilson; "Electrochemical Analysis," by Dr. A. J. Lindsey and Dr. J. V. Westwood; and "Microchemical Analysis," by Dr. D. W Wilson.

RIVER POLLUTION

Effects of Chemical Works on Fisheries

THE recent report on the state of pollution in English salmon rivers compiled for the British Field Sports Society is no creditable reflection upon the part chemical works have played in the reduction of food supplies from fisheries. Although it might be added that several firms have made serious efforts to check this fouling of salmon rivers, the fact still remains that several hundred tons of edible freshwater fish are lost every year through careless or indifferent disposal of industrial effluents into rivers. The situation is far from being a new one. But chemical works are not the only culprits, sewage works, paper mills, artificial silk works, food canning (tomato) factories and sugar beet factories often being equal or even worse offenders. Although the position has been well known for years to those closely connected with the fisheries, there are many city industrialists who are either unmindful of or oblivious to the dangers.

The River Mersey, once one of the biggest salmon rivers in the country, now receives upwards of 40,000,000 gallons of crude sewage every day—and has no fishery. Along the 150 miles of the English North-West coast from Liverpool to Barrow, a minimum of 200,000 gallons of crude sewage is discharged every mile every day, or about forty large buckets full every yard daily. The shellfish cannot be sold for human food unless specially treated. The Lancashire coast has eleven big mussel beds—three in the Ribble estuary, four in the Wyre, one in the Lune and a large one in Morecambe Bay, in addition to two in the Duddon estuary north of Barrow. They yield over 200 tons of food annually, but many are often out of action through river pollution. British salmon rivers can yield about 6000 tons of salmon food annually, but even with only a slight improvement in their pollution and a check of the growing menace there would be an immediate increase of 1 per cent or the annual addition of 50 tons of food to the national larder.

Damage on Tyneside

To review the effect of chemical works upon the main river fisheries and sea fisheries, with an eye to considering effective remedies, reference must first be made to the Tyne which once produced nearly 130,000 salmon a year, but which now yields about one-thirtieth of that total, a loss of some 1500 tons of food. In 1933, 283 dead salmon smolts were taken out of the polluted river. 30,000,000 gallons of entirely untreated sewage a day, or 10,950,000,000 gallons a year, are deposited into the river mouth by Tyneside's industrial towns. There are 268 sewage outfalls between Wylam and the sea, although the tide normally runs at 2 m.p.h. thus preventing the sewage from being cleared at a single tide. Through the increasing extraction of freshwater upriver from Newcastle and Gateshead (6,500,000,000 gallons), and also the I.C.I. works at Prudhoe (57,000,000 gallons), the pollution of estuary water has increased in density. A Ministry of Agriculture investigation found that for five consecutive June days there was no oxygen in the water from Ryton to Bill Quay. Tar acids from coke ovens and waters from coalmines are instanced as other causes of pollution. Because the tidal part has not been declared a "stream," legal action cannot be taken under the 1876 Rivers Pollution Prevention Act.

Trent a Dead River

The Tees now yields about 1600 salmon a year compared with its little neighbour the Esk which produces three times as much salmon. Even this small total is rapidly dwindling from Teesmouth industrial effluents. The Trent, with waste from the Potteries, and the Birmingham and Leicester areas all making their contributions, sees but a score of salmon struggling into its estuary waters but unable to proceed further. Until the 19th Century, the Trent was one of the country's net-fishing commercial salmon rivers, yielding over 3000 salmon a year; the industrial efforts of the first world war reduced this to 30. Most of its pollution is derived from its tributaries, the Foulea Brook from Stoke-on-Trent, the Churnet from Leek's mills, and the Tame from the North Midlands. The effluent from a Leek dye works is said to be an organic pollution that uses up the oxygen in the water, and for seven miles below this there is a complete absence of piscatorial and plant life. At Froghall and Oakamoor, pollution comes from the effluents of copper-plate manufacturers in the form of washing water used on the metal after sulphuric acid treatment, so that the water contains copper salts; for eleven miles to the Dove and for seven or eight miles below it, life is extinct. Foulea Brook is reported fouled by the untreated phenols and tar acid effluents of the four Pottery town's gas works which stain the stream deep red-brown. The effluent from Birmingham Sewage Works is declared to be purer than the water of the Tame, the worst of the Trent tributaries, again fouled with phenols and tar acids from coke oven's and gas works, plus heavy metallic salts from engineering works in the area to the north of Birmingham. The ammonia content of this stream has been found to be well over 1 part per 100,000 due to the metal acids destroying the bacteria which normally break down organic matter to neutral salts, thus suspending the ordinary self-purification of a river.

Effluents and Sewage

The commercial salmon yield from the Severn has fallen from over 24,000 fish to 340, and may well cease altogether like that from the Thames and the Mersey. The latter suffers mostly from untreated sewage from upper villages, from towns like Welshpool and from a beet-sugar factory near Shrewsbury where washing waters even after treatment and settlement encourage the growth of "sewage fungus" which extracts the oxygen. The management of this factory is making a real effort to overcome this trouble, which is common to all beet-sugar factories. The Stour brings into the Severn the Kidderminster factory effluents, the worst being untreated washing water from acid pickling in galvanising works. The Bard of Avon might turn in his grave if he knew that his erstwhile beautiful river receives, via the Sowe, 11,000,000 gallons of Coventry sewage a day, having already tried to digest 3,000,000 gallons a day from Rugby where the slow-flowing river has only 2,000,000 gallons of water a day, whereas such an amount of sewage requires twenty parts of oxygen per million. Formerly untreated sewage from Redditch, which came in via the Arrow, still leaves its effect, so long and slow is the recovery even when an up-to-date plant is installed. The poisonous effluent from a chromium still producer is quoted as a current trouble; but this raises a very difficult problem because it cannot be put into a public sewer because it would destroy essential bacteria specifically put there by sewage engineers. However, a purification plant has now been installed. The City of Gloucester too, turns all its untreated sewage into the tidal reaches, although it cannot get away at a single tide.

The Anglo-Welsh Dee is not without its troubles. For many years it is reported to have had a high mortality rate amongst its salmon population caused by the synthetic phenolic effluents from the chemical works at Cefn Mawr despite their spending £80,000 on preventives. In 1939 the accidental discharge of untreated sulphite liquor killed 1000 salmon. Serious pollution comes also from the artificial silk works and the paper mills at Flint and Greenfield, while the Queensferry sewage works, which is overloaded and out of date adds to the pollution. Tidal pollution in the Dee estuary has caused the sale of shellfish for human consumption to be banned.

With regard to the Cumberland Eden, trouble is reported by the accidental leak of spent sulphuric acid from a cellophane factory, normally neutralised and fed into a sewer. The Lancashire Ribble has had a long struggle against pollution. Its tributaries the Calder—the Darwen and the Douglas—are heavily fouled by East Lancashire towns. Once yielding 15,000 salmon a year, it now produces less than 1000, but has a stock over 3000. During the war, additional pollution decreased the stock again. The 5,000,000 gallons of sewage leaving Preston sewage plant daily need 20 parts of oxygen per 100,000, whereas 2 parts per 100,000 is most the river can provide, although the 120,000,000 gallon river flow per day overcomes this threat. Its Calder tributary is so fouled as to have lost its normal powers of self-purification owing to an unduly high chlorine content from the Colne brook which contains calico printing and dye-works effluents from Accrington via the Hindburn Brook, from tar-distillers and chemical works at Tinker Brook, where it comes out of the open settlement tanks and caustic effluent from Holt Mill Bridge paper mill.

Estuary Now Barren

The Lancashire Lune where salmon yield has fallen to little more than 2000, suffers from the bacterially untreated sewage and trade waste (tar acids, sulphuric acid and phenols) of Lancaster to the extent of 12,000,000 gallons a day. Hot water condensers at Sherton Weir add to the estuary's difficulty in coping with this. Further north, another salmon river, the Wyre, suffered during the war from sulphuric acid from an estuary I.C.I. works at Burn Naze, making D.D.T., together with spent acid from a sister factory on the Ribble which was run over in tank-wagons and put into the factory's waste pipe. The estuary was reported almost barren by the Lancashire and Western Sea Fisheries. In 1945 as much as 122 tons per week and an average of 74 tons a week were discharged into the estuary, which has an average river flow of 20,000 gallons per minute. The cod and eel fisheries have been badly poisoned by the acid. The wartime elver-fishery established in the estuary in 1941 to augment the national food supply dropped its yield in five years from 620 lb. in 1942 to 50 lb. in 1946. When the acid was put into the estuary in 1944, the annual yield fell from the previous year's 590 lb. to 82 lb. within 12 months. Space considerations prevent further examples of sea fisheries and

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CHEMICAL PORCELAIN

by H. SEYMOUR

THE chemical industry, which includes everything from the refining of petroleum to foodstuffs, is always on the alert for new materials which are unaffected by the solids or liquids being processed, so that not only is the resulting product uncontaminated by the vessels through which it has passed, but the vessels, piping and other equipment have a much longer life. Metals, both pure and alloyed, are giving excellent service; so are the various forms of glass. But a material which has grown rapidly in popularity through the war is the so-called chemical porcelain. This is, in fact, a dense hard potassium aluminium silicate of close-grained homogeneous body.

As a material, chemical porcelain is inert to the action of most chemicals. The solid porcelain body, glazed or unglazed, is unaffected by all acids, except hydrofluoric, and is relatively resistant to alkalis. It is pure, without a detectable trace of iron. Its absolute non-porosity and freedom from contamination, along with its mechanical strength and resistance to thermal shock, qualify it for a variety of applications in industrial use.

The glaze, generally pure white and glass-smooth, is sanitary in appearance and cleans with a wipe of a cloth. This glaze imparts some surface strength, but more important, makes for free and easy flow of material and clean surfaces. However, with or without the glaze, the porcelain is strong, acid-proof and non-porous. Its dense, homogeneous body, without blebs or voids, permits accurate grinding and polishing. Perfectly finished surfaces—for pipe ends, valve stems and seats, bearing surfaces, etc.—are attained in routine production.

Loss Comparison

In a piece-for-piece comparison, chemical porcelain is more expensive than some corrosion-resisting materials, but much less expensive than others. To be significant, however, a cost analysis of any industrial installation must consider, as well as initial cost, such factors as maintenance, length of life and quality of product. For the purposes to which it is suited, chemical porcelain often offers the lowest overall cost of any material. Porcelain, being non-porous, can never drink up liquids and subsequently exude them to contaminate later batches; its absolute freedom from iron is a further guarantee of purity of product; for the handling of most liquids it is completely corrosion-free, so that it never needs replacement or even shut-down for cleaning. For any process in which the corrosion-resisting material being used shows any sign of deterioration, chemical porcelain deserves thorough investigation.

Chemical porcelain is a compound, principally of plastic clay, kaolin, quartz, feldspar and certain other special property minerals. Ingredients in proper proportion, with the addition of water, are thoroughly mixed to produce "slip," a uniform fine slurry. The slip passes through a vacuum process, and is filter-pressed into flat cakes. The clay then goes to mixing machines, where it is worked into a fine-grained homogeneous plastic body, stress-free and without voids, blebs or laminations. In this state it is delivered to various departments for forming and shaping, by turning, plunging, jiggering or throwing. Complex shapes (such as the valve body) are cast. For this process, liquid slip goes directly into high-absorption plaster moulds. Both plastic-formed and cast bodies are dried in rooms with special humidity and temperature control. Carefully regulated drying is essential to get a tight, close-grained body.

Glazing

Except for surfaces where pieces are supported during firing, or those subsequently to be ground, pieces are usually glazed over all surfaces. This is a preliminary operation, taking place before the pieces go into the kiln. The glaze is a mixture, similar to the body but containing a higher proportion of fluxes, which completely fuses to a glassy smoothness with the body during vitrification, and will not subsequently chip, craze or crack away. The thermal expansion coefficient of the glaze has been carefully adjusted to a point where it is slightly lower than that of the body. As the piece cools the glaze goes into compression with respect to the body and imparts extra strength and heat shock resistance.

Owing to the nature of processing and high firing temperature, dimensions of porcelain pieces may vary slightly. There is approximately a 40 per cent volumetric shrinkage between plastic clay and the fired porcelain. This shrinkage must be compensated for. High firing temperature may cause some warping of pieces through the kiln. As an average, most dimensions can be maintained within about ± 3 per cent.

For closer dimensions or where surfaces must be finished for gasketing or close fit to other parts, fired porcelain is ground.

This work is done in grinding machines using silicon carbide or diamond wheels. Ground gasket surfaces are smooth, flat, and true.

If a still finer finish is required, ground surfaces can be further lapped and polished to a fine mirror finish. For special applications where purity or corrosion make it desirable to eliminate the gasket entirely, pipe ends may be polished optically smooth and connected without gaskets. This is a special operation and is recommended only for vacuum and low pressure applications.

Standard metal flanging methods are not practicable for flanging ceramics, porcelain, stoneware, glass, high silicon iron, carbon and other acid-resistant construction materials. Special flanging methods are required because the physical properties of these materials differ so widely from metal.

The latest flanging method utilises a cemented flanged joint. Flanges are cast of iron in one piece and undercut inside to form sawtooth rings which firmly grip the banding cement. These flanges are permanently cemented to the porcelain pipe or body of uniform wall thickness. A bank of rough sand is fused into the glaze of the porcelain body, thus forming thousands of protruding points which grip the cement: (Neat Portland cement is used for this banding unless special acid-proof cements are specified.) As pressure is drawn up on the flange, the load is distributed uniformily over the porcelain body. Sound in theory, this method has been thoroughly proved in service. Many installations employing these flanged joints have been made, yet no case has been reported of porcelain breakage from non-uniform loading of the flanges or weakness at the point of flange bearing.

Assembly Points

Standard chemical porcelain pipe,. valve and fitting ends are equipped with flanges and bolts ready for assembly. Standard flanges consist of one-piece iron castings, drilled to accommodate the bolts, and finished in acid-resisting paint. These specially designed and machined castings are permanently attached to the porcelain body by the banding method. Neither cement nor flange is in direct contact with the chemicals being handled. However, for certain corrosive atmospheric conditions special alloy flanges and acid-proof cement are used.

Chemical porcelain angle, block and flush type assemblies follow the same general construction details. The body is usually a single porcelain casting; stuffing boxes, seats and gasket ends are lathe-ground. Porcelain plugs are also lathe-ground and then further lapped and polished to a fine satin finish. The plug is then lapped into the seat of the porcelain body and this seal is tested to about 150-pound hydrostatic pressure before shipment.

Many stuffing boxes contain a double set of packing rings of blue asbestos treated with graphite and impregnated with oil. The first set of packing rings are in direct contact with liquid being handled and, of course, takes the greatest punishment. Under severe conditions this packing may gradually dry out and allow acid to work up in the stuffing box. This gradual seepage will hit the porcelain lantern ring and drip off through the side drain nipple. The second set of packing rings will always be at atmospheric pressure and prevent the acid from reaching the outside hardware. When seepage at the drain nipple is detected, the stuffing box can be tightened down or repacked as necessary. Valves can be repacked in the field by simply retracting the compression plate or packing gland and replacing the packing rings.

Porcelain Valves

Some porcelain valves include an ingenious spring arrangement which offers two important advantages. When the valve is turned closed, the porcelain plug will first contact the porcelain seat. As additional pressure is exerted on the hand wheel this pressure is absorbed by a set of spring washers. This spring cushion provides against overloading the porcelain, and locks the plug closed; it also avoids loosening occurring from mechanical vibration or temperature strain.

Processing kettles, stills and tanks are usually made with a bottom drain outlet. A cavity is formed which collects unreacted liquids or solids at the outlet and these interfere with drainage. Installing a chemical porcelain flush valve eliminates this cavity, makes for thorough agitation and trouble-free drainage. The assembly includes a stuffing box and seating spring arrangement as used in standard Y and angle valves. Built for operating pressure up to 50 lb. per sq. in., these valves are generally tested at 125 lb. per sq. in. before shipment. The valve assembly is gasketed and bolted securely to the outlet flange and the neck can be caulked or cemented, thus filling the outlet cavity.

A primary advantage of chemical porcelain is the easy adaptability of the manufacturing processes which produce it. As a result, it lends itself readily to use in a wide variety of applications. For many of these applications, the porcelain pieces must be designed and built to special order because of small runs or other limiting factors. A few of these special shapes

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MODERN COAL GASIFICATION METHODS*

by DR. D. T. A. TOWNEND

THE value of any gas-making process depends upon whether the gas produced is to be used for energy or heat requirements, or for a specific chemical industry. In this country gas is used mainly for the former purpose, except in special instances such as in hydrogenation plant. Also, in considering the newer developments on the Continent, one must not be unduly influenced by the pre-war German economy, which had self-sufficiency as its aim. Then, as pointed out by Major Gordon in his lecture on "The Production of Petroleum by Synthetic Methods," most of the German processes have been effected with lignite as the material undergoing gasification.

Typical Fuels

In this address I propose to relate our interest in the newer processes to British practice; and any process has therefore to be carefully assessed in relation to British coals. Table 1 illustrates the properties of typical solid fuels in the wood-to-anthracite series. This country has been well endowed with black bituminous coals in varieties such that there has been an abundance for all the industrial uses built up during the Industrial Revolution. The German solid fuel resourses are roughly half lignites and half black coals and, as will be stressed later, most of the newer gasification processes have emerged from the need to utilise lignites, a material most unsuitable for normal carbonisation practice. It will be observed from the ultimate analyses that, whereas lignite contains 70 per cent of carbon and 23 per cent of oxygen, gas coal contains 86 per cent and 6 per cent respectively. Then, while a lignite liberates 50 per cent of its weight as volatiles, the black coal liberates, say, 25-30 per cent, and the inherent water content of a lignite is some 50 per cent, compared with 2 per cent in a bituminous coal. It may well be that our supplies of bituminous coals suitable for most industrial purposes, have placed us behind in research. They have met our needs—and it is, therefore, rather paradoxical that any advantages available from the newer gasification processes have arisen from the need to exploit inferior fuel which, being non-caking and reactive, is admirably suited to them. These facts should not deter us from close investigation of the German methods because, although they may not easily be adaptable to our own coals, it has to be remembered that not less than 40 per cent of the world's reserve of coal is in the form of lignite.

TABLE 1

		Wood	Peat	Lignite	Bituminous Coals				Semi-Bituminous Coals	Anthracite
					I	II	III	IV		
Moisture content as found ...		20	93	50	10	5	2	2	1	1
Proximate Analysis—(dry fuel)										
Volatile matter ...		80	65	50	40	35	30	25	18	4
Ash		Trace	5	5	5	5	5	5	4	3
Ultimate Analysis—										
(dry, ash-free fuel)	C	50.0	57.5	70.0	77.0	82.0	86.0	88.0	90.5	94.0
	H	6.0	5.5	5.0	5.5	6.0	5.5	5.0	4.5	3.0
	N and S	1.0	2.0	2.0	2.5	2.5	2.5	2.5	2.0	1 5
	O	43.0	35.0	23.0	15.0	9.5	6.0	4.5	3.0	1.5

In the years between the two wars, there was an increasing tendency in this country to use more gas, either from gas or coke-oven plant. The reasons for this are obvious: gas offers a better degree of control over the composition of furnace atmospheres and furnace temperatures; high thermal efficiency in use; absence of smoke and ash; flexibility; and gas is more easily distributed. There is, indeed, a general case for increased production of cheap gas in this country; but, however gas is made, an expenditure of energy is necessary, and this must be balanced either by the greater efficiency gained by its use, or by the use of the coke produced if carbonisation is concerned, or by the value of by-products yielded in the process, or lastly by the value of the gas used as a source of chemical synthesis.

New Methods

It is well recognised to-day that a long distance fuel policy is necessary. Pending any large-scale developments, the short distance policy calls for greater efficiency in the use of the large amount of coal burnt in the raw state, e.g., of the present target production of 200 million tons, 45 are burnt on the domestic hearth, more than 60 under boilers, and probably 20 in furnaces; and one must bear in mind newer developments, such as the down-jet furnace and the extended use of pulverised fuel which should enable raw coal to be burnt with high efficiency. At present 21 million tons of coal are used in the gas industry primarily for gas manufacture, and some 20.5 million tons in the coke-oven industry, primarily for metallurgical coke manufacture.

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* Given at the Institute of Chemistry's Symposium on "Coal, Petroleum and their Newer Derivatives," at St. Andrews, July, 1947.

I have stressed this perspective at the outset, so that any novelty of the newer gasification methods, however attractive, should not obscure the present situation in this country. This said, we should undertake research into the fields under discussion as energetically as our resources will allow.

The Gasification Process

There are two main methods of producing gaseous fuels: carbonisation and gasification. When coal is carbonised, the products are obtained in the solid, liquid and gaseous states in amounts and chemical characteristics depending on the temperature employed. The coal is subjected to heat treatment within a vessel, the source of heat being applied externally; and having in mind that both coal and refractory materials have low heat conductivity, the process is accompanied by a certain loss of fuel energy. Good practice to-day may attain an efficiency of 75 per cent, and it may be doubted whether by current methods this is likely greatly to be exceeded.

Methods of internal heating, therefore, offer attraction owing to the better conditions of heat transfer, and this is achieved in gasification processes by the internal oxidation of part of the charge itself. At present coal or coke may be gasified completely by means of the producer gas reaction, and coke (sometimes coal) by means of the water gas reaction. which proceed according to the equations shown in Table 2. (1) is the main producer-gas reaction, (2) and (3) are the two steam reactions with carbon. While reaction (2) is predominant at temperatures at 1000°C. and over, at temperatures of 500-600°C., reaction (3) predominates; and at intermediate temperatures both CO and CO_2 are formed. It is usual in producer-gas practice to effect gasification by "blowing" the fuel with an air-steam blast so that both the exothermic oxidation and endothermic reduction reactions proceed continuously. If raw coal is used, gasification is accompanied by its partial distillation, thus resulting in a producer-gas of somewhat increased calorific value. In addition to the main reactions, consideration has to be given to the water-gas equilibrium (4) and, when pressure is employed, to the equilibria involving methane synthesis, *e.g*, (5).

TABLE 2

PRODUCER GAS REACTION

(1) $C + \frac{1}{2}(O_2 + 4N_2) = CO + 2N_2 + 29$ KCU

WATER GAS REACTION

(2) $C + H_2O = CO + H_2 - 29$ KCU
(3) $C + 2H_2O = CO_2 + 2H_2 - 19$ KCU

WATER GAS EQUILIBRIUM

(4) $CO + 0H_2 \rightleftharpoons CO_2 + H_2 + 10$ KCU

LURGI REACTION (PRESSURE)

(5) $CO + 3H_2 \; CH_4 + \rightleftharpoons H_2O + 58$ KCU

In general, owing to its high nitrogen content (upwards of 50 per cent), producer gas is of too low a grade to permit of economic distribution widely. In the manufacture of water gas, the difficulty of nitrogen dilution is avoided by alternating the air "blow" with a separate steam "run" which gives the "make," thus enabling the production of a higher grade gas; this, however, is achieved at the sacrifice of a proportion of the available heat in the fuel, the loss being in the potential heat of the blow gases. Possible improvements in the efficiency of producer gas practice can be effected by (i) heat recovery from the hot gases and return to the plant, (ii) maintaining as low an oxygen-steam ratio as possible, and (iii) reducing other heat losses from the system. Greater efficiency is obtained in the water gas process by using waste heat for the thermal decomposition of gas oil leading to the production of carburetted water gas, but a further draw-back is the necessity to use coke, as this involves the separate processes of carbonisation and gasification, each accompanied by thermal loss. For this reason attempts have been made to combine both carbonisation by waste heat and gasification in the same process as in the Tully and Broadhead systems.

Three Processes

As indicated, gasification processes have the advantage of internal heating, but methods are necessary whereby fuel can be gasified in the raw state while at the same time avoiding a high nitrogen content in the gas produced, coupled with high conversion efficiency. Close attention has been given to the matter during the past twenty years in Germany for a number of reasons—principally (i) the need to utilise brown coals and lignites which cannot in any event be carbonised, (ii) the need for synthesis gas (H_2-CO mixtures) for the production of liquid fuels and chemicals, and (iii) the availability of oxygen produced by more efficient methods.

I will confine this discussion to the use of O_2 (or O_2 in enriched air)—steam blasts, the typical processes being (a) the Lurgi-

Drawe operating under pressure at the lowest reaction temperature consistent with reactivity at 900-1000°C., (b) the Winkler operating at 1000°C. with a "boiling" bed at atmospheric pressure, and (c) the Leuna-type and Thyssen-Galoczy slagging producers operating at a temperature as high as 1600°C. with consequent removal of the ash in the form of a slag.

Other German developments are concerned with the use of either externally-heated reaction chambers recovering waste heat, or with the use of internal heating by a re-circulation of hot gases.

First Studies

When oxygen is used in place of air, the blow and run operations can be combined by an oxygen-steam blast; this is the basis of the three processes enumerated. In this connection it is of great interest to note that the first recorded consideration of the possibility was a discussion by Hodsman and Cobb at Leeds University contributed to the Institution of Gas Engineers in 1921. These authors considered that internal carbonisation by oxygen alone would be unsatisfactory and that the hot gaseous products of combustion of a portion of the coke at the bottom of, say, a vertical retort would not be a suitable vehicle for the transfer of heat to the rest of the coke in order to complete the distillation of the coal; and further, if all the coke were sufficiently heated, it would have to be discharged at a temperature too high to be economical or practical in a continuous process. Hodsman and Cobb formed the opinion, therefore, that for a successful process to work continuously, internal carbonisation must be accompanied to some extent by a gasification process with steam, by which means heat would be extracted from the coke and a supply of water gas provided. From calculations they made at the time, it was concluded that inevitable thermal losses in either carbonisation or complete gasification of coal with steam and oxygen would be relatively small and the thermal efficiency correspondingly high. And carbonisation with steaming would probably enable nearly one-third of the heat energy of the coal to be transposed into gas containing a small proportion of inerts and still leaving half of the original coal or coke. Were gasification taken to completion after allowing for the steam, 90 per cent of the heat energy of the coal could be recovered, 86 per cent in the form of gas of 352 B.Th.U./cu. ft. These assumptions were later tested by Vandaveer and Parr; but unfortunately only a small-scale generator was employed using either oxygen alone or a 50/50 oxygen-steam mixture. The tests were unsuccessful owing to the fall in temperature of the bed, with consequent decrease in gas quality.

An excellent general account of this field, together with the early German experiments which followed, was given by H. C. Millett, then working at Leeds University under the Joint Research Committee of Leeds University and the Institution of Gas Engineers, in the *Journal of the Institute of Fuel*, Vol. 10, 1936, p. 15; and his paper is well worthy of reference by anyone specially interested. A report of the first German experiments was published by Drawe in 1927. The trials were made with lignite briquettes, having in mind appreciation that their high volatile content would reduce the oxygen required; also, in order to obtain maximum steam decomposition, a deep fuel bed was employed. When "blowing" with a mixture containing a steam-oxygen ratio of 2.25:1 gas of gross calorific value 325 B.Th.U./cu. ft. was obtained without any sign of ash fusion, although these results were determined by the limited supply of oxygen available. Little further immediate progress appears to have been made, no doubt on account of the cost of oxygen relative to the calorific value of the gas obtained. The interest of the British Gas Industry was soon aroused, however, when accounts reached this country of experiments in Germany by the Lurgi Gesellschaft which indicated that when gasification was effected with a steam-oxygen blast at pressures of 20-30 atmospheres, a gas of calorific value comparable with that of town's gas was obtained after the removal of carbon dioxide. This was coupled with the development of the Linde Frankl process for oxygen production which greatly reduces its cost.

The development of the Lurgi process in Germany was at that time of particular importance to that country because of its large lignite deposits, having regard to its post-World War I economy. Prior to 1914, gas-making coals had been available in the Ruhr Valley, Silesia, and in the Saar Valley, but much of the supplies for Northern Germany had been obtained from British sources. Under the Versailles Treaty, however, Germany lost the Saar coalfields, and monetary problems precluded the purchase of coal from abroad. The exploitation of the lignite deposits, therefore, became a major necessity.

Lignite Problems

While lignite can be gasified easily by established processes on account of its non-caking characteristics, it does not lend itself to treatment by carbonisation, and while the synthesis of methane by means of the reaction $CO + 3H_2 = CH_4 + H_2O$ had previously been proposed as a means of subsequently stepping up calorific value, the difficulty of finding a catalyst which would maintain its reactivity with such commercial gases had hindered progress. None the less, the incorporation of the synthesis reaction held attractions, an important one being that the employment of pressures above atmospheric would increase the yield of methane and still further enhance the calorific value of the product. This said, it was impracticable to adapt the water gas process to pressure working and the Lurgi firm was quick to appreciate the possibility of a gasification process employing a steam oxygen blast under pressure, evidently with the hope that the lignite residue would itself sufficiently catalyse the water gas conversion.

Small scale experiments at once established the method, whether the fuel were lignite, anthracite or semi-coke, and experiments at 1 and 18 atmospheres respectively increased the percentage of methane in the crude gas using semi-coke from 1.8 to 13.3 per cent, or from 2.35 to 19.8 per cent in the purified gas. The most interesting feature of this work, however, was the consistency of the results, irrespective of the fuel employed. Apart from its effect on the yield of methane, pressure also offered other important advantages, not least being the ability readily to remove carbon dioxide merely by scrubbing with water, easier purification of the gas from H_2S and reducing the ground space occupied by the plant.

Subsequently, in 1936, a working-size plant was erected at Zittau, using two generators capable of an output, using lignite as a fuel, of 700,000 cu. ft./day. An interesting feature was that in spite of the high output obtained, the fuel bed was maintained below the ash fusion temperature with consequent avoidance of clinkering troubles and it was thus possible to incorporate a fire-brick lining inside a water jacket, the amount of heat passing through this water jacket, being comparatively small. When gasifying at a pressure of 20 atmospheres, the calorific value reached a figure of 445-480 B.Th.U./cu. ft., employing oxygen of 90 per cent purity. Moreover, it was found possible to distribute the supply over a distance of 12 miles without the necessity for special holder capacity.

Experimental Work at Leeds University

The original generators were 1.15 meters in diameter, each producing 15,000 cu. meters of gas/day. Later, during the war, in 1940, a larger installation was erected at Böhlen near Leipzig, comprising ten generators, each 2.5 meters in diameter and producing an actual output of 150 million meters/day which was supplied to the Leipzig-Magdeburg gas grid. A third plant was also erected at Brüx, Czechoslovakia, with an output of 80 million cu. meters/day. This plant was erected for the supply of synthesis gas for the nearby Fischer-Tropsch process.

As already indicated, the early Lurgi experiments had attracted the attention of the British Gas Industry, and a fundamental investigation into the process was at once initiated at Leeds University by Dr. F. J. Dent under the Joint Research Committee of Leeds University and the Institution of Gas Engineers (now the Gas Research Board), Dr. E. V. Evans being its chairman at the time. The Lurgi method would have obvious attractions in this country as a means of employing coals other than gas-making coals. A major issue was the extent to which bituminous coals would supply a suitable reaction bed. The early experiments, however, were carried out with semi cokes and were divided into two series, the one being concerned with the initial reaction between coke and steam under pressure, and the other with the conversion of the products of this reaction into methane.

Direct Production of Methane

The reactivity of the semi coke was found to be of importance with both reactions and a likely economy in oxygen consumption was indicated either by pre-heating the supply or by treating the semi cokes with alkali. The high yields of methane secured by operating under pressure were also at once established and a matter of great interest was that the composition of the gaseous products indicated that equilibrium was rapidly established in all the well-known reversible systems participating. But far the most striking observation was that methane formation did not depend upon the synthesis from carbon monoxide and hydrogen but upon direct hydrogenation of the coal substance, according to the reaction $C + 2H_2 = CH_4$, a process obviously responding to pressure. At 900°C. the rate of hydrogenation was very rapid and it was possible completely to gasify the fuel; interesting also was the observation that aromatic hydrocarbons such as benzene, anthracene and xylene were all as easily hydrogenated to methane at the temperatures in question. Subsequent experiments in wider reaction fields gave rise to another finding of paramount importance, namely that on the attainment of an adequate pressure, the hydrogenation reaction, being strongly exothermic, can be autogenously propagated through a cold fuel bed provided an adequate initiating temperature of the order of 500°C., had been applied locally. Following the autogenous passage of this reaction through the bed, a highly reactive residue was left, all sulphur was converted into H_2S and an encouraging yield of liquid hydrogenated products resulted. During the last few years the work has proceeded to the semi-technical scale, large reaction vessels being employed, and further information is accruing.

(To be continued)

I.G. FARBEN'S POST-WAR ACTIVITIES

Reports from the Zones

WHILE the Nuremberg trial is opening against 21 directors and executives of the former I.G. Farbenindustrie combine for their participation in war crimes, available information about the future of the works, factories and laboratories of the dye trust is still inconclusive. Decentralisation is the announced aim in all four occupation zones, but little definite news has been released about its actual progress.

According to the U.S. Military Government, 59 I.G. Farben works have been destroyed either in the course of war or under orders of the Allied Committee supervising the elimination of Germany's war potential, while 62 works have been earmarked for reparations. These two groups of I.G. Farben factories employed 104,000 and 134,000 persons respectively when last in operation before the close of the war, and do not include works located east of the Oder-Neisse line and thus now under Polish control.

Of more than 500 separate I.G. Farben units left after destruction and dismantlement, most are to be liquidated, while the remainder (about 200) are to continue in operation as independent undertakings. In the U.S. zone the previous production programme is to continue at 60 units, though, of course, the manufacture of warfare requisites will be forbidden. The most important works are Badische Anilin und Sodafabriken, with their main establishment at Ludwigshafen.

British and Soviet Zones

The most important successor to the I.G. Farben legacy in the British zone is Farbenfabriken Bayer. This company comprises the chemical works in the Lower Rhineland region, including factories at Leverkusen, Wuppertal-Elberfeld, Uerdingen and Dormagen. All these works, like those in the U.S. zone, have been suffering from low production due to fuel shortages and transport difficulties. At Leverkusen, work was brought to a complete standstill for several weeks from the middle of June onwards owing to lack of fuel. After the stoppage, these works were given fuel priority.

In the Soviet zone, several former I.G. Farben works have from time to time been reported to be in large-scale production. The Leuna plant is making a substantial contribution to the fertiliser supplies for the eastern zone, and coal-oil production has been in progress—at least temporarily. No other information is obtainable as to the nature of the products from Leuna, nor is it possible to ascertain their destination. Some of the most important I.G. Farben undertakings in the eastern zone, including those at Bitterfeld and Wolfen, have been converted into Soviet Aktiengesellschaften, operated under the direct control of the Soviet Military Administration.

Soviet corporations have been formed for the rubber industry (capital, 500,000,000 roubles), for mineral fertilisers (400,000,000 roubles), for alkalis (210,000,000 roubles), for photo-chemicals (200,000,000 roubles), for dyestuffs (120,000,000 roubles) and for plastics (30,000,000 roubles). These corporations are largely concerned with the operation of the former I.G. Farben works at Schkopau, Luena, Bitterfeld, Merseburg and Wolfen. Together, they account for three-quarters of the total capital of such newly registered Soviet Aktiengesellschaften in the eastern zone of Germany.

Trend to the East

When it was announced some months ago that a number of factories and mines were to be transferred to the German-staffed Governments of the Laender, the list did not include any important I.G. Farben works. It would thus appear that the Soviet authorities have so far retained direct control over these factories. No official information is available about the removal of I.G. Farben plant for reparations from the eastern zone.

Most of the big I.G. Farben factories were originally located in the western parts of Germany, especially on the upper and lower reaches of the Rhine, where Ludwigshafen, Hoechst and Leverkusen are the principal centres of chemical production. The centre of gravity, however, had gradually moved eastwards. It has been calculated that the investment value, less depreciation of I.G. Farben works in the Soviet zone, amounts to Rm. 2,700,000,000, whereas the assets of the combine in the three western zones did not exceed Rm. 2,100,000,000. From these sums, war damage must be deducted to the amount of Rm. 254,000,000 and Rm. 340,000,000 respectively.

The clarification of the position brought about by the decentralisation of the combine and transfer of responsibility to regional and local staffs is expected to help in stimulating production. Coal production in the Ruhr has recently shown a slight increase, with the result that more fuel can be made available for chemical works. These are to make an important contribution to the home and export trade, fertilisers and industrial fats receiving special attention.

RADIO-ACTIVE ISOTOPES

Export of Twenty Groups from U.S.

FOLLOWING the lifting of the U.S. ban on exports of radio-active isotopes, announced this week by President Truman, Australia became the first purchaser of isotopes under the new programme. The first shipment abroad, consisting of 20 millicuries of phosphorous 32 for treatment of an urgent case of polycythemia vera, a blood disorder, left the Clinton Laboratories at Oak Ridge, Tennessee, consigned to the Commonwealth X-Ray and Radium Laboratory, Melbourne.

Arrangements for the shipment, which was made by air, were made by the Australian Embassy's scientific liaison office. Air shipment of phosphorous 32 is necessary because that radio isotope has a half-life of only 14.3 days.

Types Available

The following are the radio isotopes to be made available to foreign countries and their principal fields of use:—

Antimony 122, 124, 125 for the study of venereal and general parasitical diseases; arcon 37 for study of respiratory functions; arsenic 76, 77 for the study of action of insecticides, arsenic, drugs and fumes; bromine 82 for studies of action of bromine drugs, including sedatives; calcium 45 for the study of bone and teeth formation, rickets and bone diseases; carbon 14 for studies of cancer, photosynthesis, biological processes; chlorine 36 for the study of chlorine utilisation by the human body; cobalt 60 for studies of cobalt utilisation by animals and for therapy requiring gamma radiation; copper 64 for botanical studies; gold 198, 199 for studies of blood diseases, especially leukemia; iodine 131 for therapy in thyroid disorders, including certain types of thyroid cancer; iron 55, 59 for studies of the blood; mercury 197, 203, 205 for studies of the action of mercuric drugs; phosphorous 32 for study of polycythemia vera, chronic leukemia, bone and teeth formation, fat and protein metabolism; potassium 42 for the study of diseases of the nervous system; Silver 108, 110, 111 for the study of drugs containing silver and for radiation therapy; strontium 89 for the study of bone metabolism; sulphur 35 for studies of amino acids and proteins, studies of the action of penicillin and sulphur-containing drugs; sodium 24 for studies of exchange of body fluids and blood flow, principally in connection with heart disorders; zinc 65, 69 for studies of the action of insulin.

Requests from foreign countries for shipments of isotopes will be handled by the Isotopes Branch, United States Atomic Energy Commission, Oak Ridge, Tennessee. The commission will shortly publish a catalogue for foreign purchasers which will include detailed instructions for ordering isotopes, price lists, and precautions to ensure safe handling of the materials. Prices to foreign buyers will be about the same as those for U.S. purchasers.

CLAY CONVENTION

Papers on Ceramics

THE British Ceramic Society has co-operated with the National Federation of Clay Industries in arranging the following programme of technical papers for the mornings of Thursday and Friday, September 25 and 26, during the Clay Convention at Scarborough.

The programme is as follows:—

Thursday, 10 a.m. to 12.30 p.m. The following short papers, all relating to the mechanical firing of brick kilns, will be read and discussed:—

- "Review of the Use of Mechanical Stokers in the Heavy Clay and Refractories Industries," by E. Rowden.
- "An Experiment with Automatic Stokers on a Salt-Glazed Rectangular Kiln," by R. G. Parker.
- "Some Experiences with the Application of Automatic Underfeed Stokers to Existing Down Draught Kilns Burning Salt-Glazed Sanitary Pipes," by J. Smith.
- "Mechanical Stokers for Continuous Kilns," by S. B. Stedham.
- "Data and Fuel Saving by the Patented Application of the Underfed Stoker to Kilns," by H. Torkington.
- "The Application of Underfeed Stoker Firing to a Silica Brick Kiln," by T. R. Lynam.

Friday, 10 a.m. to 12.30 p.m. The following papers will be read and discussed:—

- "Power in Relation to Process Requirements in the Heavy Clay and Refractories Industries," by D. L. Wilson and E. Rowden.
- "The Mechanical Digging of Clay with Single Bucket Excavators," by S. H. Hollowday.

A general meeting of the Building Materials Section of the British Ceramic Society will be held at 9.30 a.m. on Friday, September 25, at the Royal Hotel, Scarborough, when the question of the general secretaryship of the whole Society will be considered.

A British Ceramic Society luncheon will be held on Thursday, September 25. Applications for tickets should be made to Mr. H. Halliday, convention secretary, Drayton House, 30 Gordon Street, London, W.C.1.

Superheating by Electricity

AN INTERESTING DEVELOPMENT

CONSIDERABLE advances are being made in various countries with the small electric steam and hot-water boilers for many small industrial establishments with installations using up to, say, 1000-1200 kW. These appliances have a wide field of application, and are no more costly to operate than coal- or oil-fired heaters when electricity is reasonably priced, *i.e.*, from ½d. to 1d. per unit.

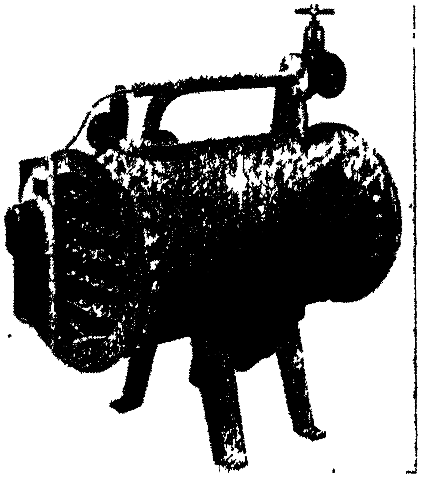
Under certain given conditions, the use of electricity for steam superheating and other applications may prove of interest. A typical installation recently supplied to a large research laboratory by a London firm has an electric superheater rated at 16 kW for 346 volt, 3 phase, 60 cycles, which supplies superheated steam at a pressure of 200 lb. per sq. in. at a temperature of 500° F., the maximum capacity being 450 lb. of steam per hour.

The general principle consists of a horizontal steel cylinder containing a series of 18 horizontal electric resistance heating coils, each of which is contained in a small-diameter steel tube fixed horizontally throughout the length of the casing in five rows, one above the other, connected to a terminal cover at one end of the casing. The steam enters the latter and is superheated by contact with highly heated steel tubes which contain resistance coils sealed off from the steam, the whole being equipped with thermostatic control gear to maintain the steam at any desired temperature.

Ease of Regulation

Superheating in this way for smaller installations carries all the advantages of electric heating in that no operators and very little maintenance are required. The apparatus has a very high thermal efficiency, occupies relatively little space per unit output. Starting up or shutting down is easily and quickly accomplished. Safety of operation and easy and accurate automatic regulation of the temperature of superheat are other attractive features. Operating costs are easily assessed—taking the thermal efficiency as 95 per cent—while all the inherent troubles associated with the use of gaseous, liquid, or solid fuels, that is, dust, grit, and poisonous smoke and fumes, and the need for tall chimneys, together with a large amount of storage space for the fuel, and complications as regards disposal of dust, ash and clinker are completely eliminated.

In connection with electric heating, there is a standard range of electrode steam boilers available in sizes of from 25-1000 kW, taking A.C. at 346-440 volts, 3 phase, 50 cycles, evaporating 75-3000 lb. of water per hour for any desired steam pressure. Boilers are in the shape of vertical cylinders made from solid drawn steel. Electrode hot-water boilers are supplied within the range of 30-1200 kW giving 102,000-4,080,000 B.Th.U. per hour, and have either manual or automatic control. In both cases, operation is at 98 per cent continuous thermal efficiency since all the heat is released into the water itself, the boiler being merely a steel shell heavily lagged with 2-in. magnesia-asbestos blocks.



Electric thermostatically controlled superheater rated at 16 kW., for A.C. 346-volt 3-phase 50-cycle supply, superheating steam at 200 lb. per sq. in. to a temperature of 500° F., showing the terminal cover partially removed.
(BASTIAN & ALLEN, LTD.)

Society of Chemical Industry

Agricultural Group Meetings

On the undermentioned dates the following papers will be read at meetings of the Agriculture Group of the Society of Chemical Industry in the chemistry department of the Royal College of Science, Imperial Institute Road, S.W.7: "Fertiliser requirements of wheat as determined by field trials"—Dr. G. A. Cowie, Potash Limited (October 21); "The rôle of chemistry in recent developments of animal insecticides"—Dr. R. S. Cahn, the Cooper Technical Bureau (November 18).

CHEMICAL PORCELAIN (*Contd. from p. 356*)

which have been economically produced of chemical porcelain for specific problems are: blow pipes and ejector tubes for process vessels: nozzles and tubes for brick-lined tanks; brick and tile shapes; orifice plates and venturi tubes; pots, jars and dishes; pump and valve sleeves and rings; nozzles, jets and diffusers; and laboratory porcelain sinks.

In developing the ceramic body used in chemical porcelain a balance has been maintained between chemical stability, mechanical ruggedness and practical manufacture.

To sum up, chemical porcelain is a dependable construction material; given reasonable handling and care it will work almost indefinitely. It has been used for some seven years, often under operating conditions so severe that no other material could stand up. The brilliant white glaze suggests fragility and commands respect from operators; but as they work with chemical porcelain, they find that, although it may look fragile, it is often more rugged than other construction materials which appear strong.

Packaging

Most porcelain pieces, pipe fittings, valves, nozzles and miscellaneous shapes are packed in wooden boxes or wire-bound crates while some valves are shipped in cardboard cartons. Large vessels are shipped in wooden boxes and positioned with clamps and braces. If porcelain is to be kept in storage, excess handling must be avoided.

Ground gasket faces on chemical porcelain equipment are often protected by gummed tape: this tape, which protects the relatively fragile edge on these ground surfaces, should not be removed. On the valve ends, there is, sometimes in addition to the tape, a paper disc, which seals the valve seat against dust, etc., which should not be removed until the valve is being installed. When discs are removed valves have to be inspected carefully to make sure the insides of them are clean and free from packing or other foreign particles.

When ready to install porcelain piping, the tape has to be removed from the ends and the gasket faces cleaned of tape, gum, or any foreign matter. This is important in keeping joints tight. Porcelain gasket faces are precision ground smooth, flat and square with the axis which permits the use of a thin, relatively hard gasket material. Thick, compressible gaskets (such as ⅛ in. soft rubber, cork, etc.) have two disadvantages: a greater surface is exposed to acid attack; and gradual compression of the material may loosen the joint, causing leakage. Experience in the field indicates that blue asbestos with a rubber binder is usually equal to or better than other materials. Some plastic sheets such as Vinylite, available in 1/64 in. thickness, may be satisfactory. Operators have found a heavy waxed paper entirely suitable for certain work.

Installation of gaskets is simplified if asphalt or similar gasket paste is used on the pipe end so that the gasket may be centred and attached on one face before the adjoining pipe is brought into position. Whether gaskets are installed dry or with paste, they should be carefully checked. Gaskets with defects such as folds, hard spots, etc., should not be used.

Nuts should be pulled up uniformily to the recommended tension. Standard ring and bolt hangers may be used on porcelain pipe lines. It is important to protect the porcelain from impingement of the metal straps by placing a thin (1/16-1/8 in.) strip of red fibre or similar stock between the porcelain and metal. Hangers should be spaced from 5 to 10 ft. apart depending on pipe size and other factors. Not more than one hanger per length is usually required. Mechanics are more prone to hang porcelain pipe too rigidly on too close centres than vice versa. Do not clamp porcelain too rigidly. Give it a margin of freedom to accommodate mechanical and thermal strains and adjustments.

Unlike metals, there is no fatigue loss of strength in porcelain. Vibration is to be avoided, however, to protect joints, gaskets and bolts from loosening. Vibration movements may be prevented from reaching the porcelain by placing a rubber snubber between the hanger straps and porcelain, and by allowing the porcelain to ride free in the hanger.

Although porcelain is physically tough, it is still a ceramic and its yield point is its breaking point. The porcelain may crack if abused or hit accidently. For this reason it is good practice to protect the porcelain at points vulnerable to mechanical shock. Under stairs, or overhead walks, low running lines in alleys are all danger points. Housing porcelain within a simple wooden frame or gable affords ample protection. Porcelain lines that are to run hot must be protected against sudden cold shock. Such shock might be a sprinkler head blowing, or a summer shower. Simple pipe insulation is adequate.

The Small Factory

The future of the small factory in British industry, a subject which contemporary political and economic trends has rendered rather problematical, is studied at length in an article by Mr. J. A. Aplin in the year book just issued by the Institution of Factory Managers.

SHIPMENT, STORAGE AND HANDLING OF SODA ASH

by H. SEYMOUR

SODA ash is usually shipped in barrels, burlap and paper bags, as well as in bulk cars and barges. Owing to the obvious saving in package cost, bulk shipments have increased materially during the last decade. Notwithstanding the cost advantage of receiving shipments of soda ash in bulk, bulk storage space may not be readily available, and provision must be made to lessen the annoyance from dust incidental to its handling; this is especially noticeable in the handling of light soda ash, but may also be evident to some extent in the handling of the heavier and larger grained dense soda ash. The saving in package cost is also partially offset by the cost of weighing the product in bulk and by the salvage value of the containers—if these are barrels or burlap bags.

The inconvenience to workmen from the dust may be alleviated by the use of a respirator, and by careful selection of machinery and equipment. There is generally no justification for special fans and dust collectors in the buyer's handling arrangements. The most effective types of collectors consist of cotton dust partitions or stocking which must be vibrated and periodically renewed, though the first cost and operating costs are so large as to make this sort of equipment economically undesirable and unnecessary in an isolated neighbourhood where dust is of minor consequence.

Soda Ash Dust

If soda ash in solution can be used in the plant process, dust can be collected by means of a cyclone separator with water sprays introduced around the point of entrance of the dust-laden air. The exit air can be still further cleaned by a commercial type of eliminator or wet baffle box. Exposure to soda ash dust is not as a rule dangerous to health as such dust is soluble and does not accumulate in the pulmonary tract. Certain individuals become accustomed to working in the dust in a short time and experience relatively little discomfort. To lessen the risk of dermatitis, to which some workmen may be subject, there are a number of ointments on the market for pre-application, and these should be made readily available to all workmen. An approved safety belt with attached rope should always be worn when entering bulk storage bins.

Bulk soda ash is generally transported in ordinary box cars or more conveniently in self-discharging cars. One of the latter types is loaded through hatches in the top and discharged through an opening in the bottom to which the soda ash is moved by built-in motor-driven drag-chain conveyors. More common is the covered hopper car specially designed to handle finely-divided granular substances. These are self-clearing, permanently enclosed cars provided with eight to ten weather-tight roof hatches for loading and four (two pairs) of bottom openings for unloading, having tight-fitting weatherproof gate closures. Rail clearances and outlet dimensions vary, but suitable unloading adaptors provide closed conveying systems which minimise dust conditions.

Under Cover Discharge

Where a clean, dry floor is available between the rails, as in a warehouse, a simple and practicable plan is to place the suction head of a pneumatic system on the floor under the car, open the hopper outlet gate over it and let the soda ash bank around the head. If the pile is protected from winds there will be little or no dust. When it becomes necessary to transfer soda ash beyond the economical range of a belt conveyor, it has been proved practicable to employ a motor truck. For this purpose a dump truck is satisfactory when fitted with a wooden or sheet metal box or container which, for intermittent service, can be made detachable so that the truck may be used for other purposes. The container must have a weather-tight roof in which are located hatches for filling and one or two outlets at the rear (near the bottom) for discharging the contents. These discharge openings may be fitted with 12-in. diameter nipples to which canvas sleeves are attached to serve as chutes for discharging the soda ash into the boot of an elevator or storage. The sleeves, when folded back and secured to the top of the truck, will serve to close the outlets during loading and transit.

The truck arrangement is especially adapted for handling bulk soda ash from barges to plant storage. The soda ash in this case, if in an isolated neighbourhood, may be unloaded from the barge by a crane using a clam-shell bucket into an elevated hopper discharging into the truck. Where bulk shipments of soda ash are made in cars or barges, it is necessary to provide a storage which has a minimum capacity of something more than a car- or a barge-load. In some circumstances, in order to reduce the size of storage, the capacity is supplemented with material in bags or barrels.

Storage of soda ash in loose piles on the floor, even in rooms that separate the piles from the other parts of a building, should be considered only as an emergency measure. Draughts produce dust conditions, as well as increased moisture and carbon dioxide absorption due to the hygroscopic nature of the ash. Moreover, the handling to and from the pile by wheelbarrows is costly. Bins, bunkers or silos are recommended.

Cylindrical or approximately square cross-section bins or storages have been found by experience to present considerable difficulty in reclaiming light soda ash, which clings to the sides of the bins and tends to arch, making removal difficult and necessitating hammering the bin to loosen it. A practical form of storage for light soda ash, bearing in mind the ease of reclaiming, is a rectangular bin having a long V-shaped (trough-like) bottom with numerous lengthwise outlets fitted with gates in ducts leading to a conveyor, and short removable canvas sleeves connecting the gate nipples at the bottom of the bin to the conveyor. These canvas sleeves are a desirable feature since they enable the operator to determine whether or not the soda ash is flowing from any particular spout. They also adjust for any misalignment of the outlet nipples.

Size of Bins

The bottom of the bins should be inclined at an angle of at least 45° from the horizontal, and it is advantageous to have a few feet of the sides at the bottom of the trough made of steel plate so that the surfaces can be vibrated or hammered to start the flow of soda ash, in the event of a " hang-up." In relation to its width, the bin should not only afford space for the numerous draw-off points, but should also lessen the effect of the ends in holding up the soda ash. It will be found that the cost of the structure, per ton of storage capacity, will tend to decrease within limits as the bin is made longer. Wood construction is the best proposition, though steel or concrete may be employed throughout for purposes of fire-prevention. The storage can be readily roofed over when placed outdoors, and should be large enough to afford a considerable dust-settling volume when handling light ash; vents may be covered with burlap to suppress escape of dust.

For dense soda ash, which is more free-flowing than the lighter varieties, almost like dry sand, the long trough-shaped bin design becomes unnecessary, if the sole consideration is to obtain a free flow of soda ash. Moreover, in such industries as glass manufacture, where it becomes important to preserve the grain size of the dense soda ash and likewise important to prevent segregation, the long trough-shaped bin may be conveniently subdivided into several sections to lessen segregation. It is advisable not to vibrate such dense soda ash bins, since vibration tends to promote segregation.

There are, among other types, soda ash hoppers of the V-shaped form of bottom which have screw conveyors placed within the hoppers, all arranged to draw soda ash to a central point. In this design, in order to obviate excessive use of power, it is necessary to take the weight off the screw by a grid system. In spite of this provision, however, the power requirement is variable and uncertain, depending upon the manner in which soda ash packs around the screw. This design, therefore, cannot always be recommended except in special cases where it is desired to save head-room. The screw conveyor or other form of extractor mechanism should be of heavy design to cope with large overloads.

Barrel Storage

Where shipments of soda ash are made in barrels or bags, it is obviously not necessary to provide large bins for bulk storage. Suitable space must, however, be reserved to accommodate incoming shipments in such containers, and facilities should be provided for the prompt unloading of railway cars or trucks. Barrels or bags of soda ash should not be stored in basements unless these are absolutely dry. Damp floors, damp air or leaking roofs will in time bring about absorption of moisture, as well as carbon dioxide, and result in caking and reduced alkalinity. Floors should be capable of supporting concentrated loads, and permit hand-trucking in and out of storage. Large tonnages are best handled on belt conveyors. There is usually some spillage caused by slight amounts of material clinging to the return belt. This can be minimised by brushes, and if the conveyor is in a weather-tight housing the spillage can be recovered.

Dust conditions, formerly the chief objection to conveying soda ash and other dusty material by means of belts, are usually confined to the loading and discharging points. Special dust housings at these points have therefore made the use of belt conveyors fairly successful. If it is necessary to discharge a belt conveyor at more than one point, a tripper—which is ordinarily used—will usually cause sufficient dust to warrant the installation of a screw conveyor or similar system. All bearings and idlers on a soda ash belt conveyor should be of the anti-friction dust-proof type.

Screw conveyors are commonly found in alkali plants where conditions are frequently hot enough to ruin fabric belts. The commercial screw conveyor, as generally constructed, is not well suited to handling the ash in continuous service, as it is quite impossible to lubricate the hanger bearings since the lubricant is decomposed by the soda ash and may form an objectionable constituent. It is therefore necessary to provide bearings that will run without lubrication.

Where continuous service is demanded, the parts of the conveyor should be of especially robust design and be amenable to quick repair and replacement. Special cast-steel hangers and couplings are used, and invariably an unusually heavy pipe is employed in the construction of the flights. The coupling should be so designed that the flights can be lifted vertically without disturbing adjacent flights, and as the capacity of a screw conveyor is limited by the capacity at the hangers, special attention should be given to the design at these points. Cast-steel hangers may be of smaller section and thus serve to decrease the constriction at the hanger points.

The trough of the conveyor, which is equipped with covers that form dust seals, is commonly made of a rectangular section, since the square corners serve to catch tramp iron. It should not be anchored rigidly to its supports, since there may be a temperature difference between the screw and the trough. If the trough *is* firmly fixed, the bearings tend to crowd out of line and an excessive amount of power is required. Screw conveyors are frequently made with bottomless troughs for trimming storages.

Conveyors

The internal ribbon type of conveyor is a form of screw conveyor consisting of a helical ribbon on the inside of a rotating cylinder, and is dustless in operation. Considered simply as a conveyance, not only is it far from superior to other conveyors generally, but it has the disadvantage that it is difficult to free an internal ribbon conveyor of soda ash once it becomes plugged. It is also not an easy matter to keep the conveyor in line if more than two points of support are needed. This is due to the fact that the shell is frequently stiffer than the supports upon which it rests. Welded girth seams in the shells of long conveyors of this type are not recommended on account of their great rigidity, and because they run very badly on their bearings. Riveted girth seams are regarded as being far more satisfactory. These objections apart, the internal ribbon conveyor is sometimes satisfactory where it is desired to cool or heat as well as convey dusty materials all in one operation.

Pneumatic conveyors are often used extensively for handling soda ash, by transporting it in a current of rapidly moving air. There are two types of such conveyors—the exhaust or suction type and the blower or pressure type; or both types may be combined. Each has its use, and both involve a pump, blower or fan for producing the movement of air, a receiver for collecting the bulk of the transported material, and a dust separator. The capacity of a suction system is limited largely by the size of the hose that can be handled in a car. The largest in ordinary use is 4 in., though a 3-in. hose is more common. The usual capacities are from four to eight tons per hour per nozzle, depending upon the uniformity and constancy of feed to the nozzle in the car. Although a suction system has the advantage that dust can be more nearly suppressed than in any purely mechanical car-unloading scheme, the car's operator will still be exposed to some dust. Nevertheless, such a system more than justifies itself in many cases where it is permitted by the higher costs of installation, operation and maintenance as, provided the larger space is available, it frequently offers the only solution.

Pressure Conveying

Soda ash can be conveyed by an air current in a pipe operating under pressure. The compressed air is usually generated by a blower or a pump and is introduced into the pipe through an ejector nozzle. This scheme may be employed in conjunction with a suction system where it is required to transport the ash more than 500 ft.—the usual economical limit of the suction system. The limit of the air pressure scheme is said to be about 2000 ft.

As distinguished from the unloading and transport schemes described above, there are in use systems which force the ash, by means of a variable-pitch screw, into a relatively slow moving current of high-pressure air which fluffs up the material and causes it to float along the pipe in a dense mixture of air and material which simulates a fluid. Owing to the irregular flowing tendency of soda ash, its lightness and other properties, such systems have not always been entirely satisfactory. Power consumption is large and interruptions frequent enough to question the practicability of the scheme in some cases. Blow-backs and line plug-ups are among the most frequent difficulties encountered. Smaller installations of this type of conveying system appear to handle soda ash more satisfactorily than larger ones.

The system can be recommended where the ash has to be conveyed along circuitous tracks, around corners and obstructions, and it seems to work best when the soda ash is fed at a constant rate. The system is not suited for dense soda ash because it breaks the particles. Soda ash has been transported about 2000 ft. in a combination vacuum and blower pressure system, at a rate said to be about 20 tons per hour. Only in cases where it is necessary to suppress dust can the first cost and operating cost of such equipment be justified in comparison with other types of conveyors and transportation schemes.

The drag flight chain conveyor, which is a comparatively new device suitable for both horizontal and vertical transportation, has many of the advantages of the screw conveyor. It will convey hot materials and is practically free from dust-raising. Although it can be used for light as well as dense soda ash, when employed as a tall elevator, cases of soda ash becoming packed in the legs and loops and between the flights have been reported. This type of conveyor consists of a chain passing through a trough or set of guides, the links of which have been shaped to form flights of skeleton design or have flights attached to them.

Elevators

Bucket drag scrapers are in use in large flat-bottom storages for reclaiming light soda ash. However, such storages are regarded as somewhat dangerous to operate if the stock piles are high, as soda ash tends to slide suddenly. Drag scrapers are generally uneconomical from the standpoint of operation.

In the alkali industry, elevators for soda ash are of two principal types: the vertical continuous bucket, and the vertical spaced bucket with centrifugal discharge. A bucket elevator has a sharply limited capacity. Overloading may cause a plugged chute, may burn off the belt (if it is of fabric construction) and may cause an excessive amount of trouble in various other ways. Where the material is conveyed by belt, if room permits, it is usually better to employ an inclined belt. However, this is seldom the case within existing buildings as the maximum angle of inclination for soda ash is about 22°, modified somewhat by the method of feeding the belt and its speed. Elevating by belt in the case of dense soda ash tends to prevent the breakage of particles.

The continuous bucket steel chain elevator is a usual design for alkali plants. A single chain is preferred to the double chain type, as the latter has been found to wear unevenly and eventually to cause operating trouble. In handling soda ash or other fine granular materials, the belt bucket type of elevator is a good design from an investment and operating point of view. There are fewer metal parts to wear off or fall off into the product than there are with steel bucket elevators. The life of an elevator belt handling cold soda is long; in some cases belts have lasted more than 30 years in steady service. As compared with chain elevators, the belt elevator can be watched for weakness, and belt renewals made at convenient times; a chain breakage is more apt to occur without warning; a casing full of buckets, chain or belt produces an emergency difficult to overcome. Soda ash is to some degree abrasive, and chain elevators especially need routine inspection and maintenance.

It is generally desirable to install rubber washers between a fabric elevator belt and the buckets. These help to keep the elevator clean by keeping the soda ash from building up between the bucket and the belt. Such building-up strains the bucket bolts excessively and destroys the fabric around them. Special elevator bolts are used to fasten the buckets to the belts and to splice the belts.

Experience shows that soda ash elevators of the centrifugal discharge, spaced-bucket type can be overspeeded as much as 35 per cent or more over the catalogue speeds, with corresponding increases in capacity if:—

(1) The buckets are loaded on the vertical leg and not forced to dig out of the boot. This calls for a deep elevator pit.

(2) A curved plate is installed at the head end on the ascending leg in order to prevent the soda ash being discharged before it has passed the head pulley. This tends to prevent so-called "back-legging."

(3) The elevator is supplied with a uniform feed.

The first condition ensures the buckets being filled and not cuffed out by the centrifugal force at the bucket. The second requirement keeps the soda ash from falling down the ascending leg. Such soda ash as is discharged at the head end is carried over the head pulley by the dragging action of the buckets, the loose soda ash playing between the curved plate and the buckets on the head pulley. If it is impracticable to supply the elevator with a uniform feed, it is best to use a standard boot as supplied by conveyor manufacturers. These are not so liable to plug as a result of surges and variations in the rate of feed. However, the buckets tend to cuff the soda ash up the boot entrance chute with the result that they are filled from only 50 to 75 per cent of their struck volume.

Screw Elevators

A type of elevator which has been recently developed elevates material vertically by means of a screw conveyor. It is said to be capable of handling many products (such as soda ash) that can be conveyed by a horizontal conveyor. These elevators are compact, dust-tight and weatherproof. The installation cost is small, operation is simple, and the power requirement is said to be only slightly more than for bucket elevators of equivalent capacity. They are made in sizes from 6 to 12 in. in diameter, have capacities

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NEW CHEMICAL EQUIPMENT

U.S. Displays Post-War Progress

POST-WAR progress in the chemical industries and war-time innovations lately revealed will be reflected by exhibits at the 21st Exposition of Chemical Industries at Grand Central Palace, New York, on December 1-6. News from exhibitors indicates a marked trend in the development of materials and units of all types designed to meet extremely difficult operating conditions, notably very high pressures and temperatures, and powerful corrosive effects. The exposition will be one of the largest of its kind ever held in America, with an unusual variety of displays including industrial chemicals, chemical products, industrial materials and supplies of many kinds, in addition to the wide range of equipment specifically designed for the process industries.

More Stainless Steel

Stainless steel is coming into still wider use in the chemical industries, and one exhibit will be exclusively devoted to this material and another will feature the precision casting of stainless steel alloys, pure nickel and monel metal, as well as valves and fittings of the stainless steel alloys.

Other exhibits will show portable and stationary horizontal plate filters of stainless steel; a display of lead-lined products including poured homogeneous lead linings on steel, lead-covered copper tubing, lead prefabricated fittings and flanges, lead equipment for the confinement of nuclear energy and also a new leaded grease for open gears and bearings.

High temperature sintered refractories of fused alumina, zirconia and other oxides, for temperatures of 1700-1800° C., catalytic carriers and supports, as well as pebbles and spheres for heat transfers, are being provided for another display.

Jet Development

A new development in the jet field which will be shown at the exposition is an eductor in which granular solids are " entrained " and conveyed by a pressure liquid, doing the work traditionally performed by the mechanical conveyor and eliminating dust.

In the laboratory field, the exposition also promises to be highly productive of new things. The infra-red gas analyser, initially developed in connection with the atom bomb project, is now finding extensive applications in petroleum, steel, chemical and allied industries which require continuously recorded analysis of components in a process stream. The apparatus to be exhibited will give a continuous record of CO_2 concentration in the atmosphere of the Grand Central Palace.

NITRATE BAN ATTACKED

Committee's Recommendations

IF proper precautions and supervision are provided, ammonium nitrate fertiliser—which has caused at least two major disasters in the last six months and was recently banned from New York port—may be transported with " reasonable safety " aboard marine vessels. This is the decision of a special committee of Federal officials.

To prohibit the handling or transportation of ammonium nitrate, the committee found, would not be a practicable solution to the problem, since many other substances necessary to the national welfare and economy and possessing minor or major hazards are now being shipped commercially. The banning of nitrate shipments, the committee added, would also adversely affect the economy of the American farmer and the programme of relief to war-devastated countries.

Not an Explosive

The committee, composed of eighteen representatives of government agencies interested in the transportation of the fertiliser, also recommended a series of safety measures for handling the substance. It ruled that chemical should properly be classified in Coastguard regulations as a dangerous oxidising material, rather than as an explosive, since it would not heat spontaneously and was not affected by friction or impact normally encountered in transportation.

Fire, the Chief Hazard

" The committee feels," the report stated, " that, with proper precautions and adequate supervision of all phases of loading, stowage and transportation on board vessels, ammonium nitrate can be transported with reasonable safety. The principal hazard to guard against is fire." The explosive hazard of ammonium nitrate fertiliser in normal land transportation was negligible.

The committee accepted the findings of a Coastguard board investigating the Texas City disaster, which devastated the city and killed 500 and injured thousands, that the explosion aboard the *Grandcamp* was caused by the " careless disposal of cigarette butts " and that the subsequent explosion aboard the *Highflier* was the result of the " and possible contamination of ammonium nitrate with sulphur."

The chemical stability of the substance, unaffected below temperatures of 200°F., must be altered by " fire under confinement in a compartment which lends itself to retention of heat and the building up of pressure and contamination with sulphur or other substances and subsequent ignition by fire," the committee reported.

RIVER POLLUTION

(*Contd. from page* 354)

inshore pollution from chemical effluents of from the dumping of surplus wartime ammunition into the sea, but it is a well-known fact that a large area of the Cumberland in-shore fishery was destroyed by the dumping of surplus ammunition into the sea after the first world war. Sufficient example I think has already been given to prove the case that chemical pollution is seriously reducing an essential source of national food supplies. It remains to suggest some remedies.

It is a very interesting fact that no serious effluent problem has been experienced by the Dee Fishery Board from the Sandycroft Chemical Works whose effluent is comparatively small and disappears into a deep sub-stream soak-away, with no apparent connection with the river bed. The problems of river pollution depend also upon the amount of water flow in the river to cope with the pollution and dilute it. Serious pollution may, therefore, arise without any increase of effluents, but owing to hydro-electric stations and industrial plants taking water out of river estuaries and courses, or water-cooling and electric power plants discharging millions of gallons of hot water, 85° F., which has not the same oxygen ratio to cope with sewage, etc.

Canning and Silage Wastes

Suspended solids in the wastes from tomato, corn and pea canning factories, should be screened or filtered on to the land for much-needed manure. On no account should untreated silage waste from farms be deposited into sewers. The use of lime, or in some cases lime and ferric chloride, will encourage settling and sludge formation in the screened wastes from tomato, red beet and other canneries, and the dried sludge cakes can be sold for manure. Tomato waste is so acid that it requires 1 lb. of lime per 500 gallons before filtering through a filter bed.

Effluent from dye works can be treated in bacterial filters in the same way and same time as domestic sewage. The problem of many towns is the limited capacity and out-of-date methods of their sewage plant although Alternating Double Filtration would cope with many problems. Estuary towns and industrial plants on Tyneside could construct main sewer trunks to carry the sewage and the industrial wastes to purification works lower down the river, and from thence out to sea. Liverpool, like Gibraltar, has some sewage barges engaged in dumping at sea, but this is only an infinitesimal proportion. Spent sulphuuric acid effluents should be treated with lime and caustic soda and allowed to settle before passing into the sewers. Caustic wastes need a soda recovery plant. Mechanical screens will take out cotton wastes from artificial silk works and some heavy coagulated tar products from industrial effluents.

The Monsanto Chemicals, of Cefn Mawr, have spent £80,000 on pollution prevention measures, including dilution lagoons with a capacity of 5,000,000 gallons, and an American Dow process of bacteriological effluent treatment costing £75,000.

SODA ASH

(*Continued from page* 368)

up to 50 tons per hour, and are capable of elevating up to 50 ft. These rotary elevators may be especially suited to intermittent service as in elevating fine materials from a track hopper to a storage bin, rather than for continuous day-in and day-out heavy-duty work.

The power requirements for elevating and conveying soda ash vary widely with different methods, equipment and rates of handling. Power estimates useful for preliminary and approximate plans, but not sufficiently accurate for designing purposes, expressed in terms of horse power to elevate or convey 10 tons of soda ash per hour to a height or distance of 100 ft., are:—

To elevate by bucket elevator, 10 tons per hour through 100 ft. height—2 h.p.

To convey by level belt, 10 tons per hour through 100 ft. distance—.2 to .5 h.p.

To convey by screw conveyor, 10 tons per hour through 100 ft. distance—5 to 7.5 h.p.

To convey by air suction system, 10 tons per hour through 100 ft. distance—30 to 60 h.p.

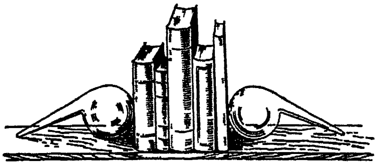
Revalidation of Indian Licences

Indian import licences for commodities listed below, instead of expiring on June 30 last have been automatically revalidated by a recent Public Notice issued by the Chief Controller of Imports, New Delhi. The licences, will now remain valid until December 31, 1947 (Appendix I) or September 30, 1947 (Appendix II).

Appendix I :—Mineral oils (flash point not less than 150°F.); pine oil; synthetic essential oils; greases, petroleum jelly and paraffin wax; metallic ores (except ochres and other pigment ores); and asphalt.

Appendix II :—Sodium acetate; sulphate of alumina (iron free); chromium acetate, hydrosulphite of soda; Rangolite C or Formosul L; sodium nitrite; Shirlan paste; desizing agents; levelling agents; penetrating agents; scouring agents; wetting out agents; emulsifying agents; mordanting agents; turkey red oil; oil and grease removers; textile oiling agents; solvents for printing discharging agents; anti-reduction kier boiling; and softening agents; zinc chloride; dyes derived from coal tar, and coal-tar derivates, used in any dyeing process. Various chemicals, drugs and medicines and chemicals in bulk packing *excluding* potassium bichromate, sodium bichromate, sodium sulphite, sodium bisulphite, sodium hyposulphite, chromic acid, and chromic sulphate.

Scientific and surgical instruments.



A CHEMIST'S BOOKSHELF

The Mechanism of Contact Catalysis. By R. H. Griffith. 2nd. Edition. pp. 273. Oxford University Press. 1946. Price 21s.

It is no exaggeration to say that chemical reactions on the scale required by the present chemical industry would have been impossible without the discovery of catalysts. The immediate and successful technical application of catalysts has made research into the conditions which govern their operation a profitable venture. Because of the inevitable development, however, the original research, which was concerned chiefly with improving the efficiency of industrial reactions, has been found to be inadequate and study of the catalyst itself has proved a more fundamental and sounder line of approach.

That the subject has been a favourite one for research is evidenced by the great number of papers published from year to year. The author of this book, realising that few had access to all the literature on the subject, published the first edition in 1936, thereby helping to co-ordinate the findings of various workers and amplify the knowledge of the subject which had been compiled earlier by Rideal and Taylor. The present edition is similar to the first in that the author reviews the more important papers published in the last twenty years. Several additions have been made in view of the fact that interest in catalysis as a subject for research seems not to have diminished since the publication of the first edition. The increasing knowledge of processes such as diffusion and adsorption and especially of the nature of surfaces and the unbalanced atomic forces which exist there has, in fact, given a certain impetus to further research in the mechanism of contact catalysis.

Such discoveries have necessitated rewriting some sections, but where further information has confirmed past findings the treatment is unaltered, although additional references are given. On the other hand, some controversial items have been omitted. The preparation and activation of catalysts have received more comprehensive treatment than in the first edition in view of the increased interest in their structure. There is an expanded section on crystals and lattice defects, and more attention has been devoted to the disposition of organic reactants on the catalyst surface since this seems to be one of the more promising methods of elucidating the action of catalysts. Gas-solid systems are treated at greater length.

Although the book covers a wider field than might be imagined from the title, it remains essentially a critical review of the subject. Because of this the author has evidently found it difficult to arrange his material in the systematic manner characteristic of a good text-book. The provision of cross-references, which are generally undesirable, has not solved this problem. Beyond pointing out—and rightly so—that experimental results should be interpreted with caution in view of the many difficulties encountered in work of this type, the author does not indicate which papers are worthy of further study and is content to mention very briefly the findings of the investigators. While appreciating the difficulty of summarising the results of many workers, the reviewer feels that some chapters of the book tend to be collections of facts which must be appraised by the reader.

As a review, however, the book is excellent and may be recommended to all who wish to keep abreast of latest developments in this important branch of chemical research.

T. B. King

SCOTTISH QUICK-FREEZING INDUSTRY

The development of the quick-freezing industry in Central Scotland is being pressed forward with the maximum speed and energy by fruit growers, potato growers, farmers, meat producers, for whom this new method of processing promises to be attractive. Dundee has been selected as an obvious central point for this work and considerable expansion has already taken place there.

Quick-frozen tomatoes, rhubarb, potatoes, asparagus, cauliflower, cherries, loganberries, and red currants attracted tremendous attention at the Dundee Made Exhibition, and demonstrated the current trend of activity in this area where one large firm (Smedley's Ltd.) has now taken over a former flax mill for an extension of its activities.

This development of quick freezing is being limited at present only by the lack of adequate machinery and facilities to handle the bulk of produce available, some of which has recently been in glut supply.

PERSONAL

MAJOR KENNETH GORDON, who is to be this year's recipient of the Institute of Fuel's Melchett Medal, will, on October 1, deliver a lecture on "Hydrogenation in the Fuel and Chemical Industries," when he will also receive the award from the president of the Institute.

Maj. Kenneth Gordon

DR. H. BUCKLEY, who has been appointed in charge of the Scottish office of the D.S.I.R., is a graduate of Manchester University. He was on the staff of Toronto University before serving for 25 years on the staff of the National Physical Laboratory, where his special field of research was concerned with photometry and illumination. During World War II he was for a time a liaison officer in the British Commonwealth Scientific Office in Washington and, during the last three years, was a member of the Intelligence Division at the department's headquarters.

DR. J. A. SMITH, lecturer at Glasgow University in applied chemistry with special reference to nutrition, has been appointed deputy director of the Hannah Dairy Research Institute, Ayr. Dr. Smith was on the staff of the Hannah Institute for ten years, being appointed research assistant in biochemistry in 1936. He began his research career at Birmingham University and continued it at University College and the Imperial College of Science, London. Later he was lecturer in biochemistry at Liverpool University

PROF. CHAO-LUN-TSENG, Professor and head of the Department of Chemistry at the National Peking University since 1931, arrived in London on September 2 for a three-month visit at the invitation of the British Council. The professor, who was president of the Chemical Society of China from 1935 to 1937, is editor-in-chief of the *Journal* of the Chemical Society and the author of numerous books and articles on chemistry and kindred subjects.

MR. D. E. FLAHERTY has been appointed a director of Guest Industrials, Ltd., and technical manager of the Raw Materials Division. **MR. RALPH BYFIELD** has been appointed sales manager.

DR. H. N. RYDON has been appointed to the University Readership in Organic Chemistry at Birbeck College, London, with effect from October 1.

MR. K. S. BURCH and **MR. C. H. SWEDLER** have been appointed directors of The Chemical Supply Co., Ltd.

DR. L. H. LAMPITT, president of the Society of Chemical Industry, who is at present in Canada, addressed the Canadian Section of the Society at a luncheon on September 8.

MR. L. J. GENT has resigned from his post of works manager and chief chemist of the United Phosphate and Malt Co., Ltd., to devote more time to his work as a food technology consultant.

OBITUARY

MR. ANDREW HENDERSON, a former lecturer in chemistry at Glasgow University, has died at Dalry, Ayrshire. Sixty-nine years of age, Mr. Henderson was educated at Glasgow University. After taking his Arts degree in 1901 and his B.Sc. in 1906, he was appointed assistant to the Professor of Chemistry before becoming a lecturer in organic chemistry in 1921. He retired from the university in 1943.

DR. PAUL MAUTNER, who came to this country from Czechoslovakia in 1939 and later became a British subject, has died in his native country at the age of 46. Dr. Mautner was well known in this country as a research chemist for British Industrial Solvents, Ltd., for whom he undertook the development of many valuable processes during the war.

Manufacturer Leaves £23,550

MR. J. F. BOTTOMLEY, the former head of J. C. Bottomley and Emerson, Ltd. (chemical manufacturers), who died last April, left net personalty £23,550.

Home News Items

British Association Meetings.—The 1949 meeting of The British Association will be held at Newcastle-on-Tyne, and the 1950 meeting in Birmingham.

Institution of Chemical Engineers.—Application forms for the 1948 examination for associate membership can be obtained from the hon. registrar of the Institution at 56 Victoria Street, Westminster, S.W.1.

Faraday Society Discussion.—A general discussion on "The Labile Molecule" has been arranged by The Faraday Society, to take place in the Physical Chemistry Laboratory, Oxford, from September 23-25.

Retail Sales.—Relatively little change occurred in the level of retail sales in June and July last. Board of Trade figures just issued give as sales index for July 142, against 139 in the previous month. Chemists' sales increased in all areas—by 18.2 per cent in the South of England.

Lime Subsidy Continued. — Farmers throughout the U.K. will continue for a further term of five years to receive the subsidy of 50 per cent of the cost of buying and transporting lime for agricultural purposes, states an announcement by the agricultural authorities of the U.K.

Unilever "Stagger" Plan.—With effect from Monday last, the 2700 staff of Unilever House, E.C., will work from 8.45 a.m. until 5.15 p.m. instead of from 9 a.m. until 5.30 p.m. This is the outcome of conversations between Unilever and Lever Bros. and the City of London Local Transport Group.

Foreign Travel Allowance.—Announcing the reduction of the allowance of currency for necessary business purposes in Europe and the Mediterranean areas from £10 to £8 per day, the Treasury states that "Applications for exchange to go abroad for good professional reasons or to participate in conferences of reputable international bodies . . . will be considered on their merits."

Raw Materials Division.—Harris & Dixon, Ltd., and Guest Industrials, Ltd., have jointly announced the formation of a Raw Materials Division, within Guest Industrials, Ltd., to co-ordinate and develop the marketing of the wide range of chemicals. colours and minerals at present being produced and distributed by their various associated and subsidiary companies. The address is Guest Industrials, Ltd. (Raw Materials Division), 81 Gracechurch Street. London, E.C.3. Telephone: Mansion House 5631 (16 lines).

U.K. Tin Stocks.—Stocks of tin metal in Ministry of Supply hands at July 31 amounted to 5687 long tons, 3935 tons being with consumers.

15,413 Visitors.—Attendance at the "Enterprise Scotland" exhibition reached a peak on Saturday, August 30, when 15,413 people passed the turnstiles. The average daily attendance was about 11,000.

Accommodation for I.C.I. Workers.—Northwich Rural Council is to erect 100 aluminium bungalows for I.C.I. workers, the project being scheduled for completion by the end of the year. I.C.I. is understood to have agreed to make a contribution to the rate fund of £4 10s. per dwelling for 60 years.

Streptomycin Tests Encouraging.—The Ministry of Health has announced that tests made with streptomycin have been sufficiently successful to warrant supplies being made available to patients suffering from tuberculous meningitis or miliary tuberculosis.

Resin Store Fire.—A store containing five tons of resin and 4000 tins of grease was destroyed by fire at Dussek Brothers, Ltd., oil refinery, London Road, Crayford, on September 2. The N.F.S., using thousands of gallons of foam, prevented the flames from spreading to the main building.

Chemistry of Oils and Fats.—A post-graduate course of eight lectures on "The Modern Chemistry of Oils and Fats" is to be given by Dr. J. H. Skellon at Chelsea Polytechnic. They will be given weekly on Fridays commencing on October 24 at 7.30 p.m.

Port Sunlight Fire.—Prompt action by workmen on the spot, and by the works' fire brigade and N.F.S. units, on September 3, quickly checked a fire which involved bags of coconut cake meal in the seed crushing mill warehouse at Lever Bros., Port Sunlight works. Damage was slight and confined to bags.

Tin Producers Penalised

"It seems most inequitable that those (tin) producers who strained every nerve and in many cases seriously depleted their richer ore reserves in order to further the war effort should, more than two years after the cessation of hostilities, be subject to an arbitrarily controlled price for their product."—Mr. Ernest V. Pearce, chairman and managing director of Consolidated Tin Smelters, speaking at the annual meeting of the company last week.

Overseas News Items

Shell in Pakistan.—The Shell group of companies has formed two new subsidiaries in Pakistan—The Shell Company of Pakistan, and the Burmah-Shell Oil Storage and Distribution Company.

New Products of Merseburg Bunaworks.—The chemical works Buna-Schkopau, near Merseburg, Eastern Zone, has extended its production programme to include, besides various Buna products, the manufacture of acetic acid, lime and glysantine.

Phosphate Workers Strike.—Some 12,000 phosphate workers are among the leading elements in the 24 hour strikes to protest against the reduction of the bread ration from 8½ oz. to 7 oz. daily which was paralysing production early this week in several French industrial centres.

Further U.S. Alkali Price Increases Expected.—It is expected that all leading manufacturers of alkalis in the United States will increase their prices because of higher costs. The Solway Corporation has already increased its prices by 10 to 25 cents per 100 lb., effective from the beginning of October.

U.S. Firms to Participate in Dutch Industry.—An increasing number of American concerns is reported to be seeking participation in Dutch enterprises. For instance, a well-known U.S. chemical company, which specialises in the manufacture of products required in dyestuffs production and in the manufacture of textiles, leather, etc., has signed an agreement with the N.V. Chemical Factories Serve, of Delden.

Chemical Raw Materials for U.S.S.R. Zone.—It is reported that foreign trade in the Soviet occupation zone of Germany has increased considerably in the course of last year. Coal has been received from Poland as raw material for the chemical industries, phosphates have arrived from North Africa, superphosphates from Holland and pyrites from Norway, while Switzerland sent dyestuffs. Exports consisted chiefly of finished products, mainly glassware.

Guano Production in Chile.—According to a report of the Cia. Administradora del Guano, Peru, the production of this fertiliser during 1946 amounted to 113,536 tons, the highest total recorded for the past five years. For ten years, however, the requirements of guano by national agriculture have been far in excess of production. Chile may be in a position to export cement to the extent of about, 50,000 tons per annum, as national production of this material is said to exceed local requirements.

Canada's Chemical Imports.—Canada's total imports in January-May were valued at $1,025.7 million (against $722.2 millions in the same period of 1946) and included $48.6 million for chemical and allied products ($39.3 million in 1946).

British Trade Representatives in Japan.—A representative each from Imperial Chemical Industries, the shipping concern of Mackinnon, the Pekin Syndicate, and Liptons, reached Japan last week on what is described as an "exploratory trade mission."

Portuguese Wolfram Ban Lifted.—The Portuguese Government's ban on the export of wolfram which came into effect in June 1944, and which brought mining of the metal to a complete standstill, has been lifted. Production this year already amounts to 625 tons.

U.S. to Build Egyptian Factories.—A number of factories for the production of chemicals, electrical equipment, textiles and canned food are to be erected in Egypt by five U.S. concerns. The present project, it is reported, will cost the Egyptian Government between 10 and 20 million dollars.

German Lead Mines Resuming Production.—The Eiffel Lead Mines at Mechernich, have been given general permission to resume production. During and before the war the works supplied the chemical and accumulator Industry. The Schildergasse mines near Wenden, British Zone, are now preparing for the exploitation of lead and zinc deposits in the southern part of Westphalia.

U.S. Native Sulphur Production.—According to the U.S. Bureau of Mines, a record production of 377,218 long tons of native sulphur was produced in that country during May, 1947. In the first five months of the year, production was 14 per cent greater than in January-May of 1946, and sales exceeded output. At the end of May, stocks had decreased by 274,357 long tons since the first of the year and were lower than they have been since 1937.

Soda Ash Duty Concession.—Imports of soda ash, which the Indian Government at one time hoped would be produced internally on an adequate scale, are still to be permitted. Rebates of the import duty have been granted from time to time since 1935. The last extension, which was due to expire on June 22 last, is to be continued until December 31, 1948, subject to possible review in the event of home production becoming greatly increased.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

SANODA LTD., Salford, manufacturing chemists. (M., 13/9/47). July 29, £5000 debenture, to A. S. Baxter, Salford; general charge.

GOLDEN VALLEY CHEMICAL WORKS LTD., Stroud. (M., 13/9/47). August 1, series of £3000 (not ex.) debentures, present issue £1000; general charge.

GRANTO LABORATORIES LTD., London W.C. (M., 13/9/47). August 1, £2000 Land Registry charge, to T. C. Brookes, London, and another, and £500 Land Registry charge, to T. C. Brookes, London, and another; charged on properties. *£4607, December 30, 1946.

Company News

The name of **Teign Valley Charcoal, Ltd.**, Glastonbury, has been changed to Torvex Peat, Ltd., as from August 13, 1947.

Lime Shares Acquisition.—The entire shares in Beswick's Limeworks, near Buxton have been acquired by Staveley Coal and Iron Company.

The name of **Wrentnall Baryta Company, Ltd.**, 95 Gresham Street, London, E.C.2, has been changed to Angela Austral Mines, Ltd., as from August 15, 1947.

The nominal capital of **Watford Chemical Company, Ltd.**, 17 Half Moon Street, London, W.1, has been increased beyond the registered capital of £10,000, by £50,000, in £1 ordinary shares.

The nominal capital of **Potash, Ltd.**, Fenton House, Fenchurch Street, London, E.C.3, has been increased beyond the registered capital of £10,000, by £40,000, in £1 ordinary shares.

The nominal capital of **C. M. Milligan and Clarke, Ltd.**, chemical manufacturers, etc., 4 Golden Square, London, W.1, has been increased beyond the registered capital of £1000 by £4000 in £1 ordinary shares.

The nominal capital of **Antigen Laboratories, Ltd.**, chemical and biological manufacturers and bacteriologists, etc., 95 Great Portland Street, London, W.1, has been increased beyond the registered capital of £5000, by £10,000, in 4000 participating preference and 6000 ordinary shares of £1.

Pharmaceutical Supply (London) Ltd. (441,607).—Private company. Capital £300 in £1 shares. Manufacturers of and dealers in chemical and other similar products, etc. Subscribers: E. E. Rogers and R. J. Hulse. Mrs. Edith E. Rogers, of 26 Meadow Way, Littlehampton, Sussex, is the first director.

Wm. Neale & Son (St. Helens), industrial, chemical and structural engineers, is recommending payment of a 6d. dividend per 2s. ordinary share, or 25 per cent, less tax, for the year ended March 31, as against 5d. or 20 5/6d. per cent, less tax, last year. This year's trading profit is £71,431, last year's being £50,773.

The Distillers Company Limited has announced a net profit of £3,428,719 for the year ended March 31, as compared with £2,574,760 last year. A final dividend on the ordinary stock of 2½ per cent, less income tax, which with the interim dividends already paid, makes the dividend for the period of 22½ per cent, less income tax, has been recommended. A special dividend on the ordinary stock of 2½ per cent, less income tax, is also proposed.

New Companies Registered

Springham Chemicals, Ltd. (441,173).—Private company. Capital £1500 in 1500 shares of £1 each. Chemists, chemical manufacturers, manufacturers of and dealers in photographic requisites, etc Subscribers: S. Hawkins and Evelyn I. Chant. Registered office: 1 Budge Row, E.C.

Powerlube Laboratories, Ltd. (441,647).—Private company. Capital £1000 in £1 shares. Manufacturers, producers, distillers and importers of and dealers in oils, lubricants, greases, etc. Directors: Capt. Cranville Burgess and W. D. Hall. Registered office: 3 Albemarle Street, W.1.

Chemical and Allied Stocks and Shares

Despite the coal strike news, stock markets rallied at the beginning of the week, hopes apparently being centred on the possibility that American aid to Europe may be accelerated. Best levels were not held, but no heavy selling developed; although as the week progressed, there was an increasing tendency to await the next instalment of the Government's crisis plans, more particularly the new export schedules and priorities, which must have an important bearing on the outlook for many industries. In contrast with the better tendency in industrial shares, British Funds were dull and lower on balance, although generally the volume of business remained on moderate lines.

As was to be expected shares of chemical and kindred companies moved closely with the prevailing market tendency and in most instances have rallied well, although best levels were not held. Imperial Chemical were better at 44s. 6d., partly on talk that an increase may be made in the interim dividend; but this is not generally expected. Monsanto Chemicals were also higher at 52s. 6d. after an earlier decline. W. J. Bush were 90s. and B. Laporte 87s. 6d., with Lawes Chemical 10s. shares around 13s. William Blythe 3s. shares 15s., and British Glues & Chemicals 4s. ordinary at 18s. 9d. regained all but a small part of an earlier fall. Greeff-Chemicals Holdings 5s. ordinary marked 15s. 6d. and dealings in Fisons ranged from 59s. to 62s. 6d. Borax Consolidated recovered to 48s. 1½d. and in anticipation of the consolidated accounts and hopes of a higher relative price for the ordinary units when they are " split " into five units of 4s. each, Distillers strengthened to 128s. 9d. Lever & Unilever eased to 48s. 3d. following the annual meeting, but there was a rally to 71s. in Turner & Newall. United Molasses, partly in view of the company's tanker fleet interests, came in for attention and rallied well to 45s. 7½d. British Aluminium were 41s. 6d., British Oxygen 88s. 9d., and there was a rally in paint shares, Goodlass Wall being 34s. 3d., Pinchin Johnson 53s. 9d., and International Paint £6½d.

Iron and steel shares appeared to derive some encouragement from the Government's decision not to introduce a Bill for nationalisation in the next Parliamentary session. In some quarters it is being suggested that nationalisation of iron and steel may in fact have to be abandoned. It is pointed out in the City that in any case iron and steel shares seem moderately valued, because a fair compensation basis in the event of nationalisation would in most cases be well above current market prices. Moreover, unless there is a serious fuel crisis in the winter it should be possible to maintain dividend payments and with few exceptions yields on this basis are generous. United Steel were better at 23s. 9d., with Dorman Long 24s. 3d., Colvilles 24s. 6d., and Guest Keen 42s. 3d. Elsewhere, Babcock & Wilcox improved to 63s. 6d., with Thomas & Baldwins 12s. 3d., Stewarts & Lloyds 46s. 3d., and Tube Investments £5⅞.

Textiles have been helped by anticipations of higher export targets, and Courtaulds and other rayon shares rallied for a similar reason. Boots Drug improved to 53s. 3d., Sangers were 27s. 6d., Beechams deferred better at 22s. and Timothy Whites 39s. 6d. Griffiths Hughes improved to 42s. 6d. Oil shares rallied strongly after an earlier decline, but later reacted again, Anglo-Iranian being £8¾ with Shell 85s. 7½d. Burmah Oil 75s. 7½d. and V.O.C. 79s. 4½d.

British Chemical Prices

Market Reports

A STEADY demand and a firm price structure characterises most sections of the industrial chemicals market. No major changes have been reported during the past week and the general position so far as supplies are concerned remains much the same with deliveries to the chief consuming industries proceeding reasonably satisfactory. The demand for pitch, both for home trade and for export, has been good, and other sections of the coal tar products market are as active as the supply position permits.

MANCHESTER.—The Yorkshire coal stoppages are increasing the difficulties of some of the chemical-consuming industries in the Lancashire area and of chemical manufacturers themselves. On the Manchester chemical market during the past week, however, a steady demand for a wide range of products has been reported and there is a persistent call for contract deliveries from the Lancashire and Yorkshire textile trades and from other industrial users. Export inquiries have again also been in evidence. The demand for fertiliser materials is improving, while among the by-products there is a steady absorption of supplies of crude tar, creosote oil, benzole and other descriptions.

GLASGOW.—In the Scottish chemical market business has been normal in the past week with little outstanding to report. With the continued shortage of caustic soda and soda ash, it has been reported that black market activities in these materials are ever increasing. It is to be hoped that the appropriate authorities will be able to stop or at least reduce considerably the supplies reaching unauthorised sources. Considering the difficulty which bona fide firms engaged chiefly in the manufacture for export are experiencing in obtaining these materials, necessity for taking action energetically is obvious.

In the export market this has been a very satisfactory week and a number of large orders have been booked. One result of the sterling convertibility reduction has been an increase of interest in British chemicals in India. Our prices previously, were not competitive with American prices, although it is interesting to note price of many materials from this country are cheaper c.i.f. India than the same materials produced in India. The general outlook in the export market is satisfactory, but it would be of great assistance in securing orders if something could be done to reduce the cost of bags and drums.

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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Manufacture of carbonaceous fuels.—A. R. Schlumberger. December 21, 1945. 37588-89/1946.

Method for increasing the resistance of stainless steel devices to sulphuric acid.—Soc. d'Electro-Chimie d'Electro Metallurgie et des Acieries Electriques d'Usine September 15, 1945. 27610/1946.

Process for the recovery of petroleum oils from shale and the like.—Standard Oil Development Co. April 17, 1943. 17372/1947.

Resinous compositions and methods of applying the same to fibrous materials.—Stein Hall & Co., Inc. September 28, 1945. 27470/1946.

Dicarbamates and polymers thereof.—Wingfoot Corporation. January 16, 1946. 15556/1946.

Hydrazo esters.—Wingfoot Corporation. January 16, 1946. 18111/1946.

Azo esters.—Wingfoot Corporation. January 16, 1946. 18300/1946.

Method of stabilising an aqueous solution of ascorbic acid (Vitamin C).—Abbott Laboratories. Feb. 4, 1946. 22876/1946.

Process for the recrystallisation of melamine.—Ciba, Ltd. Feb. 8, 1946. 2134-36/1947.

Method of producing antisera of high strength.—Ciba, Ltd. Feb. 8, 1946. 3409-10/1947.

Process for removing metal oxides or metal salts from heavy metal surfaces and cleaning preparations therefor.—Ciba, Ltd. Feb. 8, 1946. 3411-12/1947.

Manufacture of primary alcohols.—Ciba, Ltd. Feb. 6, 1946. 3558-60/1947.

Beta - amylose - iodine compound and methods for the production of same.—Claimint Chemical Co., Inc. May 28, 1943. 19793/1947.

Ferrous alloy.—Coast Metals, Inc. July 16, 1942. 19769/1947.

Manufacture of silica gels.—Davison Chemical Corporation. Feb. 6, 1946. 36375/1946.

Mould lubricants.—Dow Chemical Co. Feb. 7, 1946. 2541/1947.

Organo-silicon halides.—Dow Chemical Co. Feb. 4, 1946. 2542/1947.

Composition of matter.—Dow Chemical Co. Sept. 19,1946. 16192/1947.

Preparation of ethylene diamine.—E.I. Du Pont de Nemours & Co. Feb. 5, 1946. 3389/1947.

Manufacture of carbon dioxide-modified polymers of ethylene.—E.I. Du Pont de Nemours & Co. Feb. 5, 1946. 3390/1947.

Manufacture of polymerisation products of ethylene.—E.I. Du Pont de Nemours & Co. Feb. 5, 1946. 3391/1947.

Adhesive compositions and products formed therewith.—E.I. Du Pont de Nemours & Co. Feb. 9, 1946. 3664/1947.

Copolymers of acrylic nitriles with lesser amounts of conjugated dienes.—B. F. Goodrich Co. Jan. 27, 1940. 19740/1947.

Process for the production of penicillin. —Heyden Chemical Corporation. July 12, 1945. 33853/1946.

Aryl sulphide compounds and process for their manufacture.—A. D. Macallum. Feb. 4, 1946. 2985/1947.

Chemical manufacture.—Mathieson Alkali Works. Feb. 5, 1946. 442/1947.

Alpha-acylamide acetic ester compounds. —Merck & Co., Inc. Feb. 9, 1946. 2396/1947.

Production of glycols and polyglycols from olefinic oxides.—Montecatini Soc. Generale per l'Industria Mineraria e Chimica. July 16, 1941. 18393/1947.

Production of anthacene derivatives particularly for use as plasticisers.—Neville Co. Feb. 2, 1946. 34677/1946.

Method of converting hygroscopic fertilisers composed of hydrous calcium nitrates into little hygroscopic fertilisers.—Office National Industriel de l'Azote. Feb 8, 1946. 3770/1947.

Method for the continuous making of copper oxide.—Progil & Cie de Produits Chimiques et Electrometallurgiques Alais Froges & Carmargue. Feb. 4, 1946. 3230/1947.

Mineral oil composition.—Socony-Vacuum Oil Co., Inc. June 9, 1944. 18726/1947.

Treating hydrocarbon oils to reduce the sulphur content thereof.—Socony-Vacuum Co., Inc. Oct. 28, 1942. 20887-88/1947.

Process for the manufacture of cellulose esters.—Soc. Rhodiaceta. Feb. 8, 1946. 3222/1947.

Extreme pressure lubricants.—Standard Oil Development Co. Dec. 26, 1942. 16489/1943.

Use of fluid catalyst technique in hydrogen production.—Standard Oil Development Co. Jan. 8, 1941. 18513/47.

Process for burning lime.—Standard Oil Development Co. Jan. 1, 1943. 19664/1947.

Method of producing alpha-naphthoquinones, and the improved alpha-naphthoquinones resulting therefrom.—Velsicol Corporation. Oct. 16, 1943. 19752/1947.

Removal of sulphur compounds from materials containing same, and apparatus therefor.—K. Williams. Feb. 4, 1946. 1151/1947.

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Telegrams: ALLANGAS FLEET LONDON
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SCOTTISH OFFICE:
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MIDLANDS OFFICE:
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This Year . . . Next Year . . .

IT is anybody's guess when atomic power will first be used on a commercial scale in industry. The pros and cons are debated by many eminent men, but without agreement among themselves or certainty of deduction. In the light of the present coal shortage we shall review estimates made in the past month. With the starting of the first experimental pile in England during August we shall begin to learn more about the problems involved from the practical angle.

Writing from the angle of the T.U.C. Scientific Advisory Committee in the T.U.C. annual report, Professor P. M. S. Blackett estimates that the first experimental power plant running on atomic energy may well be working in the United States within two years. Within five years from now we should be in a position to set about designing reliable power units for large-scale power stations and to get a fair estimate of the cost of atomic power production. Assuming, then, that the technical prospects looked as favourable as they do now, we should be in a position to plan an investment programme in atomic energy power plants which would make a marked contribution to our power resources within, say, a couple of decades. So, by 1970 it would be quite possible that a large proportion of the power of this country would be obtained from atomic energy.

We are frankly a little surprised to find Professor Blackett taking the view that the technical prospects of atomic power appear to be favourable to-day. The technological problem is the major obstacle to-day, as Sir Wallace Akers has shown in his address to the Fuel Luncheon Club last winter. Cost is, of course, the key. Let it be supposed that a populous district is dependent on an atomic pile for the production of power. What happens when something goes wrong? There never was an industrial process plant that worked day and night, year after year, without some repairs and maintenance, generally involving a stoppage to put matters right. But when an atomic pile develops its inevitable troubles, it cannot be put right in an hour or two. The whole mass within its concrete shield is so dangerously radio-active that it cannot be approached for months. How many times must the initial capital equipment be multiplied to provide a continuous source of power upon which the dwellers in the district and the industries upon which they depend for a living can *rely* as they now rely on power stations?

Atomic energy was discussed also at the World Power Conference held this month at The Hague. What strikes us as the most realistic estimate yet published was due to W. F. Davidson, of the Consolidated Edison Company, New York. An extensive and costly programme of analysis and experimental investigation must be carried out before the first practically useful power plant can be constructed. Even the trial pilot plant in the U.S.A. designed to check the possibilities of one type of power plant will not be ready till 1948, while other projects are still less advanced. Information based on "Scientific Information Transmitted to the United Nations Atomic Energy Committee by the U.S. Representative" coupled with values derived by the author show that the total cost per kWh of producing power, including interest on capital, is 0.8 per cent/kWh for nuclear power as compared with 0.65 cent for coal-

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derived power, taking coal at 7 dollars a ton. This, it must be emphasised, is an estimate only.

The cost of construction of power plants for 75,000 kW installed capacity was estimated early in 1946 as: Nuclear plant, 25,000,000 dollars; coal power plant, 10,000,000 dollars. The rate of depreciation must clearly be much greater for the atomic energy plant, since it will include a high obsolescence factor due to more rapid improvements than for the coal power plant. Labour costs are likely to be higher for the atomic plant. Suggestions have been made that atomic plants combined with gas turbines could operate where water is scarce and that, to quote from the report: " The nuclear power plant, in connection with a modern gas turbine, might be desirable as operating or stand-by plants to existing utilities." Neither of these suggestions will stand scrutiny. The extent to which the atomic power plant can remain independent of water is no greater than, and may be less than, that of a coal-fired plant. The high capital cost of an atomic energy plant would preclude any possibility of using it as a stand-by. An interesting comment made by Mr. Davidson is that the final determination of the extent to which atomic power can be used and the methods adopted for generating it may well be determined by the international agreements that are made for the prevention of the use of atomic energy for war.

Professor Cockroft has indicated that a pile generating a heat equivalent of 1000 kW " burns " 1 gram of nuclear fuel a day. The pre-1939 production of uranium was of the order of 1000 tons, and this quantity is about sufficient to generate the annual units of electricity required in the United Kingdom. These uranium deposits were of the highest grade and might soon be exhausted at the rate at which they would be mined if atomic power came to be generally used. The cost of uranium, which was £2000 a ton before the war, might well rise so considerably as to make atomic power uneconomic in coal-producing countries. There are, of course, other possibilities, including the use of thorium. It must not be forgotten, however, that all the radioactive materials are, in our present state of knowledge, rare, or comparatively rare, elements. If atomic energy came into commercial use, even if only in countries not possessing coal deposits, for how long would the raw materials last? That would appear to be a problem worthy of close examination before we launch into vast expense in developing the atomic pile for commercial power production. We wasted coal for centuries before we learned how limited were our reserves. Will atomic energy, so invaluable for medical and other purposes, have the same grim history?

Nor must it be forgotten that atomic energy only displaces coal used for electrical power. The generation of electricity from coal is thermally one of the most inefficient of thermal processes. Atomic energy is attacking coal at its weakest point. For uses of coal for which the thermal efficiency is of the order of 60-85 per cent, the supplanting of coal by atomic energy is not even remotely in sight. Prophecy is always dangerous, but at the moment we are not among the optimists in foreseeing the early use of atomic power.

That we are not alone in this belief is evident from the remarks of Professor

M. H. L. Pryce, a physicist of Oxford University, who last Saturday told scientists that for atomic energy to be significant as a solution to world power problems we must be willing to wait a good part of a century. We should need something like 70,000 tons of uranium a year to replace the other forms of energy, he said; this means that the world could run its industries for a short time on atomic energy and then they would be brought to a stop for lack of sufficient basic material.

NOTES AND COMMENTS

Obstacle Race

CONFORMING with the official injunction to press forward with export goods at all costs is often about as profitable as playing " Happy Families " with half the cards missing. That is the purport of a recent letter to the *Daily Telegraph* from Mr. G. S. Langridge, who manages a Bristol firm of chemical manufacturers and whose experiences typify the sort of thing with which so many of his colleagues are wearily familiar. Some of our formulæ (wrote Mr. Langridge) contain over 15 different raw materials, which have to be obtained through three or four Ministries. The fact that we obtain an export licence and permits from three Ministries carries no weight with the fourth department, should this department decide to refuse us a permit. Exporters should beware of the question : " Were you manufacturing this product in 1937?" The fact that one's company has indulged in research and experiment during the war to produce new processes and formulæ is apparently frowned on, as in many cases it is the pre-war sales that decide the amount of material to be released. Faced with the likely prospect of frustration at every stage, the writer of this letter—and hundreds of others like him—cannot be blamed for entertaining the thought which, says Mr. Langridge, immediately arises on receipt of an export order : " Is it worth the time and trouble to start the dreary round of letters, calls and explanations to the various Ministries concerned?"

Struggle for General Aniline

BEHIND-THE-SCENES struggles now going on for control of the large American chemical firm of General Aniline and Film Corporation are described in the August issue of the American journal *Fortune*. The Corporation was taken over by the Alien Property Custodian in 1942 and has for five years run this £10,000,000 company, which was originally formed as the American I.G. Chemical Corporation with I.G. Farben guaranteeing both principal and interest on the original £7,500,000 of capital. Its directors, says *Fortune*, were nominated by Farben, although the financial control was not exercised directly, but through a Swiss firm set up by Farben known as I.G. Chemie. Late in 1939, following a merger with two of its subsidiaries, there emerged the General Aniline company in its present form. But with the approach of the entry of America into the war, and the threat of seizure by the Government, there was a change. One by one, German names disappeared from the directors' list. In June, 1941, the U.S. Treasury moved in when I.G. Chemie's funds in the U.S. were blocked. In February, 1942, the Government became the effective owner of General Aniline by seizure of I.G. Chemie's majority holdings. There was a clean sweep of directors and many executives. But, apart from fighting a number of anti-trust cases directed against General Aniline, the Custodian of Alien Property worked very hard to protect the patents of the company, so that whoever takes over the company will not find it completely stripped of patent protection.

Interested Firms

NOW, having operated the Corporation for five years, the Government is anxious to get rid of it. But, like the boy who got hold of the wolf by the tail, so long as they hang on to it things are relatively quiet, but the moment they let go there will be plenty of action. If any move is made to get rid of General Aniline, it is expected that the Swiss concern will immediately go to court. But the law requires that there must be free bidding for General Aniline. Among the concerns which are in the running is the Remington Rand company, which would like to branch out into the dyestuffs industry. Already this company owns 7000 shares in General Aniline, and is the largest minority holder. It has also bought its way into the Swiss Chemie company. Other potential buyers might be du Pont, Eastman or American Cyanamid—who would, however, have to watch the anti-trust laws closely—and such firms as Monsanto, Dow and Heyden Chemicals. It is suggested that Monsanto would probably fit in best with General Aniline. To the outsider it is an interesting struggle with few bets on the result.

No Supermen

IS Germany to be allowed to rebuild her "chemical empire" in perhaps a few years hence? That is the question being asked in many quarters, and most uneasily in America at present, on which some light is cast by the able summary (reported elsewhere in this issue) of the relative situations of the two industries, British and German, by Mr. J. Davidson Pratt, director of the Association of British Chemical Manufacturers. The home industry which, in the first flush of victory was promised full consultation on treatment of German competitive organisations and a share in plant requisitioned for reparations, has received neither, the latter more understandably in view of the virtual productive bankruptcy of the ex-enemy when the bombs and the barrage ceased. But there is no adequate excuse for the withholding of information of the extent and the nature of the plans for the rehabilitation of the German industry, without which all plans implementing the Crippsian super export plan in the next few years will be severely handicapped. Meanwhile, the director of the British Chemical Manufacturers has helped to dispose of a fable which has had wide credence, chiefly among the uninformed. "Germans are not marvellous chemists," he says. On a point-for-point basis, British chemists have made a substantially bigger contribution in fundamental research. But their industrial application *via* the I.G. octopus and elimination of competitors was almost an invincible weapon . . . which they must not be allowed to wield again.

The Export Plan

THE export plan revealed last week on behalf of the Government by the President of the Board of Trade was as grim and uncompromising as it was welcome. Contrasted wth the miasma of hopes and fears and dependence upon others in which our affairs have languished, this resolute statement of the facts and realistic targets, the most forthright action by the present Government which we can recall, should commend itself to the country as it evidently did to Sir Clive Baillieu, who acted as spokesman for the Federation of British Industries at the joint meeting of employers and workers at which the plan was unfolded. Sir Stafford Cripps, endowed with the un-Socialistic gift of stating facts and facing their implications wthout evasion, did not mince matters in describing how industry is now to be called upon to increase our export total by not less than £31 million monthly and ultimately by much more, towards which the chemical industry is required to supply a total export output of £6,850,000 a month by the middle of 1948 and £7,500,000 a month by the end of the year. Equally reassuring at this very critical period was his willingness to recognise the complexity of some of the problems inherent in so fundamental a re-direction of all our industries and the severity of the deprivations which will be required until the corner is turned and export surpluses are available. It merited the approbation voiced by Sir Clive Baillieu of "your sincere and courageous approach to this grim situation" and encourages some confidence that there will be realistic co-operation from the Government to sweep away the many bureaucratic roadblocks of the sort instanced in an accompanying Note and Comment. Unless the condition is fulfilled, our final state will, of course, be infinitely worsened. That reflection should bring even hardened demagogues and bureaucrats to their senses.

Continental Electricity Project

A CO-OPERATIVE scheme for supplying the electricity needs of eight Western European countries is one of the important issues to be decided at the Paris economic conference. The aim is to provide by 1952 an adequate electricity supply derived from hydro-electric stations and generators operating on brown coal for France, Italy, Switzerland, Austria, Belgium, Holland, Luxemburg and Western Germany. The Alpine countries would contribute to the "pool" hydro-electric power and Belgium, Holland and Luxemburg would be the principal producers of current from brown coal. A total production of 6000 million kW is envisaged. The scheme provides for a full exchange of information and a pooling of such materials as coal, cement, and steel.

GOVERNMENT'S PLANS FOR EXPORTS

CHEMICALS TARGET—£7,500,000 MONTHLY

"EVERY month from now onwards that we fail to achieve our programme will mean a draft upon our ultimate reserves and will bring us nearer to the point where we shall have to make even more drastic cuts in our imports of foodstuffs—since there is practically nothing else left to cut. Urgency is therefore the keynote of this task." So said Sir Stafford Cripps (President of the Board of Trade) speaking at the Central Hall, Westminster, on Friday to an audience representing industrialists in all parts of the country and the T.U.C., to whom he described in detail the Government's " crisis exports " campaign.

Of the overall plan Sir Stafford said: " The lack of balance of trade with which we are concerned is not merely between this country and the dollar countries but is between this country and the rest of the world.

£600 Million Unbalance

" Our present unbalance is in the region of £600 million a year upon the basis of our estimated import and export level before any of the present special adjustments had been made. We should to that extent have been living upon borrowed money and to that extent we would therefore have failed to provide our own standard of living out of our own productive efforts.

" It is that very large prospective gap of £50 millions a month that we have got to fill as quuickly as we can and if possible before our ultimate reserves of Foreign Exchange and gold are run down below the danger point. We have very little time and very small reserves with which to accomplish this very big job."

The situation, he continued, would be met by cutting expenditure and increasing earnings and the extent to which the former would be required would depend largely upon the success of our export campaign. By reduction of imports, if the existing price levels continued, £228 million would be saved in the coming year, leaving an adverse balance of £372 to be made up by increased exports, or £30 to £31 million a month. Additionally, it would be necessary to direct production and exports so as to reach a state of balance with individual countries, especially important suppliers of foodstuffs and raw materials.

Current exports, excepting the abnormally high total in July, averaged about £95 million monthly, so that the projected increase represented an addition of about one-third of the present total. This would suffice only to balance the reduced imports, involving reduced meat rations and no petrol for private motorists. We could obviously not be permanently satisfied with a level of imports so low, so that a considerably greater increase would ultimately be needed.

Meanwhile, a number of countries had adopted a policy of limiting imports, especially of consumer goods and had concentrated upon capital goods for building up their own economy. The dollar shortage might increase that tendency, but it could also bring customers to this country for goods which they had hitherto imported for dollars. It was therefore extremely difficult to say which goods would be most saleable and important to retain flexibility to switch over from one export to another.

Home supplies would have to be derived from surplus after the minimum increase had been achieved. In the case of textiles, for example, we must export £275 million worth a year as a first step and £350 million by the end of 1948. What was left could be used for the home market. That roughly was the principle upon which they would proceed in all industries.

"By the end of next year," continued Sir Stafford, " we must aim at reaching at least 160 per cent of 1938 exports, compared with the 140 per cent at which we are immediately aiming. The only way in which we shall be able to raise our living standards will be by more exports and more home production, and with that object we have set our second stage of the task at 160 per cent of 1938 exports by the end of 1948."

Unessentials to be Cut

To this end cuts were being made in the Armed Forces, there would be reductions in manpower for less essential consumption and the whole capital expenditure would be reviewed. The last would require a substantial postponement of the flow of new machinery and equipment to our own industries and cuts in building and civil engineering.

" The task entails every manufacturer becoming export-minded. Many who have hitherto devoted themselves to the home market exclusively or almost exclusively will have to seek foreign markets energetically. In some cases it will be possible to arrange for exports by an industry as a whole, in others we shall have to deal with the individual units. In cases where particular firms or whole industries find themselves unable to sell abroad their export quota we cannot just allow such goods to be diverted to the home market because the labour and if possible the materials will have to be used in some alternative form of export if we are to maintain our required level of exports. It will mean, therefore, in such cases that unless new and appropriate markets abroad can be found the materials and labour will have to be withdrawn from that particular form of production for use in more profitable forms.''

Exports would have to be directed to countries from which we draw our major supplies, but the Government desire to use as little compulsion as possible and, rather than embark on a complex system of licensing exports, would rather rely on a general control by agreement.

PLANNED INCREASES

	£ million monthly		
		Target	
	4th quarter, 1946	Mid 1948	End of 1948
Chemicals	3.14	3.75	5.45*
Proprietary medicines	0.43	0.5	0.5
Other drugs and medicines	0.97	1.0	1.25
Dyes and dyestuffs	0.65	0.85	*
Paints, pigments, distempers	0.41	0.50	*
Varnishes and lacquers	0.06		
Printers ink	0.07	0.10	0.15
Other products	0.12	0.15	0.15
Total	5.85	6.85	7.50
Percentage of 1938	161%	188%	206%
Oils, fats and resins			
Fuel oils and petroleum etc.	0.32	0.60	0.60
Other oils, soap, wax etc.	0.20	0.18	0.20
Total	0.52	0.78	0.80
Percentage of 1938	64%	96%	98%
Pottery, ceramics and refractories	1.06	1.525	1.675
Glass	0.53	0.67	0.825
Asbestos	0.31	0.35	0.40
Cement	0.38	0.30	0.40
Gauges and fine measuring tools	0.025	0.03	0.035
Scientific instruments	0.475	0.52	0.55
Gas and chemical plant	0.075	0.10	0.12
Paper and manufactures	1.45	1.45	1.75
Rubber and manufactures	0.65	1.0	1.25
Polishes	0.14	0.30	0.35
Synthetic resins	0.31	0.35	0.35
Total Manufactures	**78.29**	**100.345**	**115.9**
Percentage of 1938	**127%**	**163%**	**188%**

* Includes, Dyes, Paints, Varnishes, etc.

PLUTONIUM ATOMIC PILE

SUCCESSFUL operation of a new type of chain reaction plant or " pile " which may influence the design of future experimental reactors for power was announced on August 29 by Dr. Norris E. Bradbury, director of the Los Alamos Scientific Laboratory, which is operated by the University of California for the U.S. Atomic Energy Commission.

Dr. Bradbury said the " fast reactor," as it is known scientifically, gives a more intense source of fast neutrons than physicists heretofore have been able to obtain, except during the brief time of the test of the first atomic bomb in the New Mexico desert in July, 1945. " It is hoped," he said, " that such a source will make possible the study of fast neutron chain reactions in more detail, and thus be another step toward finding the best type of chain reactor for the production of useful power."

The new unit, in a sense, is a controlled version of the atomic bomb itself, according to the announcement. It is the first to employ the fission of the man-made element, plutonium, instead of normal uranium, and it is also the first to use fast neutrons. Other chain reactors at other Atomic Energy Commission installations utilise slow neutrons.

The heart of the fast reactor is a small vessel containing a critical mass of the nuclear explosive plutonium which emits neutrons of high energy. The high energy or fast neutrons are caught by other atoms of plutonium before they have been slowed down by colliding with any materials except the nuclear fuel.

All other reactors have mixed with their nuclear fuel some other substance, such as graphite, or water, which serves to slow the neutrons. The Los Alamos reactor utilises no diluting material and thus shares with the bomb the property of using the neutrons from fission almost as soon as emitted.

Post-war Chemical Production

Home and Export Supplies Compared

A CONSIDERATION of production figures for chemicals since the war (see table) reveals that in 1946 copper sulphate (95 per cent) and ammonium nitrate (88 per cent) were almost entirely disposed of in the export market. This is no departure from pre-war custom as far as the former is concerned, whereas ammonium nitrate production found its way into the home market in 1938 to the tune of 43 per cent. The fact that only 12 per cent of this latter commodity reached the home market in 1946 reflects a post-war development to meet the effects of the world shortage of nitrogenous fertilisers. The output in 1946 was above the high level to which it had been raised during the war, and is largely produced in Government ordnance factories. For ammonium sulphate the output in 1946 was far above pre war, with the home market getting nearly all the increase. The division between home supplies and exports in 1946 was regulated in accordance with the allocations of the Fertiliser Sub-Committee of the International Emergency Food Council in Washington.

Coal-Tar Products

Distribution of the three coal-tar products is still controlled with the aim of giving priority to home industries. The proportion for export is now far lower in the case of pitch than it was before the war because the internal demand has increased. Although total supplies of sodium carbonate and caustic soda in 1946 exceeded those in both 1944 and 1938, production had to be curtailed because deliveries of fuel fell short of allocations; the volume of exports showed a 28 per cent increase over 1938, but the percentage of the total exported was much the same as in that year. A much higher level of exports would have been achieved had it not been necessary to meet the needs of essential home industry.

Increases Over Pre-war

With the exception of salt and of coal tar pitch, exports of which were reduced by one-quarter and one-half respectively, the quantities exported in 1946 showed substantial increases over the pre-war levels. In the home market, deliveries of dyestuffs were rather lower than in 1935 because of the contraction in the textile industry, but for all other products the figures were well above those in pre-war years. Only for salt, ammonium sulphate and coal-tar pitch was the proportion of total supplies exported substantially lower than before the war,

Commodity	Year	Supplies for* Home Market	Supplies for* Export	Proportion exported Per cent.
		Th tons	Th tons	
Ammonium sulphate	1935	211	254	55
	1944	691	145	17
	1945	575	263	31
	1946	623	277	31
Ammonium nitrate	1938	12.3	16.3	57
	1944	82.9	21.6	21
	1945	66.7	41.9	39
	1946	19.9	141.6	88
		Index Numbers†		
Sodium carbonate (soda)	1938	73	27	27
	1944	87	27	24
	1945	86	32	27
	1946	98	34	26
		Th tons	Th. tons	
Salt (sodium chloride)	1938	594	232	28
	1944	708	137	16
	1945	698	139	17
	1946	727	169	19
Copper sulphate	1935	‡	35.5	(100)
	1944	25.1	20.3	45
	1945	8.5	44.3	84
	1946	3.0	52.2	95
Refined tar ..	1944	572	38	6
	1945	570	73	11
	1946	586	154	21
Coal tar pitch ...	1935	171	369	68
	1944	442	83	16
	1945	402	208	34
	1946	396	172	30
		Th. gal.	Th. gal	
Refined cresylic acid •	1935	3,494	1,682	33
	1944	4,712	1,973	30
	1945	4,564	2,044	31
	1946	5.290	3,122	37
		Th. cwt. Total finished dyestuffs	Th. cwt.	
Synthetic dyestuffs	1935	492	101	17
		Textile dyestuffs only		
	1944	321	78	20
	1945	288	76	21
	1946	362	181	33
		Total finished dyestuffs		
•	1946	426	186	30

* For salt and copper sulphate figures are estimated from production and actual exports. For the remainder, figures are deliveries for home market and for exports

† Since production is essentially in the hands of one firm the level of supplies is indicated by index numbers based on *total supplies in* 1938=100.

‡ Exports in 1935 exceeded production in that year.

STEAM BOILER PLANTS

A NEW British Standard, "British Standard Specification for Log Sheets for Steam Boiler Plants (B.S. No. 1374)" has just been issued. The British Standards Institution points out that the high cost of fuel, which is likely to be a permanent feature of our industrial economy, coupled with shortage of supplies, a condition which may last for some years, makes efficiency in the use of fuel imperative. Efficient generation of steam used for power or process work is also likely to improve production on the works, with consequent increased output and reduction in manufacturing costs. Any measures that can be taken to that end will be to the financial advantage of the user and in the national interest.

The charts now published by the British Standards Institution in B.S. 1374 log sheets for steam boiler plants have been prepared by practical boiler engineers from industry and Government departments to help those who have not hitherto kept adequate records. They are regarded as the minimum observations that should be made. Used systematically and regularly, and if submitted to careful examination each day by the engineer-in-charge or other responsible person they should go far towards ensuring a regular increase in the quantity of steam produced from each pound of coal put into the boiler furnace.

Copies of this specification may be obtained from the British Standards Institution, Sales Department, 24 Victoria Street, London, S.W.1, price 2s. post free. Supplies of log sheets themselves and summary sheets for regular use can be obtained from the same address.

PHOTOGRAPHY EXHIBITION

The Exhibition of Applied Photography, recently organised in London by Kodak, Ltd., is to open for five days at the People's Hall, Leeds, on September 8. From September 29 to October 3 it will be at 244 Deansgate, Manchester, and from October 13 to 17 at the McLellan Galleries, Sauchiehall Street, Glasgow. It can be seen at the Chamber of Commerce, Birmingham, from October 27 to 31, and finally at the City Museum, Bristol, from November 10 to 14. Doors will be open from 10 a.m. to 5.30 p.m. at all centres.

The exhibition provides a practical demonstration of various industrial uses of photography, and business executives, production managers and designers who are interested, are invited to apply to Industrial Sales Department Kodak, Ltd., Weald stone, Harrow, Middlesex, for tickets.

NEW BETRO SERVICE

THE British Export Trade Research Organisation has started a new drive to help manufacturers find markets in those countries which are now putting up high tariffs against British goods or banning them completely, in order to foster their own national industries.

In a special announcement just made to its members, BETRO points out that many manufacturers do not realise fully the value of their patents, trade marks and registered designs as potential invisible exports. While patents and registered trade marks are obviously desirable assets, the value of the "Know-how" should not be under-estimated. Even where there are no patents or trade marks, considerable sums of money can be made by entering into what is generally known as a "Know-how" contract with foreign manufacturers.

A special department has been set up in BETRO which is already busy negotiating for the sale on a royalty basis of the "Know-how" of a well-established British product which has hitherto—for various reasons—been unable to get inside the tariff walls. By this contract, all the experience and knowledge of the British firm will be made available to the American firm against agreed minimum annual payments. In this way, dollars will be earned without making any drain on the country's material resources.

Fisons' Offer to Bengers

It has been disclosed that Fisons, manufacturers of chemical fertilisers, have made an offer to Bengers for the exchange of that company's shares with those of Fisons. Details have been posted to Bengers' shareholders, and the offer will remain open until October 8.

Bengers' share capital (all issued) is £570,000, and consists of £150,000 6 per cent preference in £5 shares, and £420,000 in £1 ordinary shares. The company has paid 10 per cent dividends on its ordinary shares for the past eight years.

Fisons' authorised capital mounts to £7 millions (£3,777,196 issued), comprising £1,976,647 4½ per cent preference, and £1,640,549 ordinary shares.

Canadians Better Fed

"British stomachs are so conditioned by austerity food that we no longer can eat a real meal. It is impossible for us to eat a meal such as Canadians are accustomed to."—Dr. L. H. Lampitt, president of the Society of Chemical Industry, speaking at a food conference in Canada last week.

INDIRECT METHODS OF HEATING

IN the Chemical Industry, practically all reaction vessels are either heated or cooled by indirect methods, and although in the paint and varnish industries a considerable amount of synthetic resin is produced in reaction vessels which are heated directly in settings using gas or oil burning equipment, indirect methods of heating have amply shown their superiority. Among the reasons for this are the improved quality of the product resulting from the avoidance of local overheating and the close control of temperature which may be effected. The reduction of the fire risk when operating with inflammable materials is another factor.

The term "indirect heating" includes all methods of heating of the contents of reaction vessels which involve the heating of a heat transfer medium which is then caused to transfer this heat, either latent or sensible, through the wall of the reaction vessel or by means of coils within the reaction vessel. The heat transfer medium can be heated in a boiler or in coils in a furnace setting for the use of gas or oil firing. Electrical heating, where economical, could be used for heating the heat transfer medium, but in many cases, it be found more satisfactory to heat the reaction vessel directly either by ribbon elements on the shell of the reaction vessel or by elements immersed in the contents of the vessel.

Hot Water Heating

It occasionally happens that where temperatures below 100°C. are required and when the materials are sensitive to heat, a circulating hot water system is used. For conditions where the temperature of the heating medium is less than 90°C., the system consists simply of an open reservoir from which the hot water is pumped through the heat exchange apparatus and restored to the reservoir, steam being directly injected into the reservoir. For temperatures up to say 160°C., water under pressure may be circulated in a closed system fitted with an expansion tank and a heat exchanger to heat the circulating water. Steam may be used in the heat exchanger or the heat exchanger may be a coil in a direct fired setting. This method of heat transfer has been used successfully in the polymerisation of vinyl compounds where close automatic temperature control with an exothermic reaction is required.

In cases where temperatures in the range of 100/160° C., heating by saturated steam is most common, and gives very high rates of heat transfer. It can be combined with water cooling to give control of exothermic reactions.

The high pressure steam system is quite extensively used in Germany, and a typical arrangement of this type of unit is shown in Fig. 1. The critical temperature of steam is 374° C., corresponding with a pressure of 218 ats., and this method of heating is regarded as having a maximum temperature of 320° C.

The heating unit consists of a number of coils through which the water passes in parallel and which are connected at their inlets and outlets to common manifolds. The coils are set in a brick furnace which is heated either by gas or oil firing. The steam then passes to the coils in the reaction vessel, is condensed and returns by gravity to the heating unit, the upper manifold of which should be about six feet below the condensate outlet on the reaction vessel.

Owing to the high pressures involved, jacketed vessels are not an economic proposition and heat transfer to the contents of the reaction vessel must be by coils. In cases where it is undesirable to have coils inside the vessel, the construction shown in Fig. 2 is of interest and has the advantage that relatively thin-walled vessels may be used,

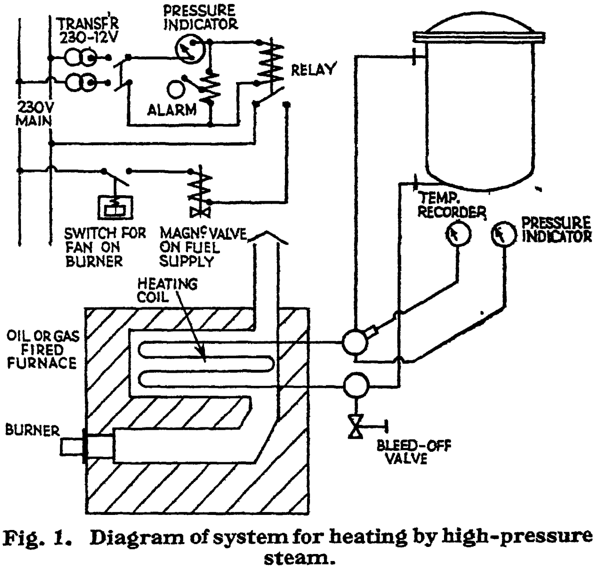


Fig. 1. Diagram of system for heating by high-pressure steam.

which in the case of expensive materials of construction is an important consideration. Thus a vessel 6 ft. in diameter working under vacuum need only have a wall thickness of ½ in. stainless steel. Another consideration in favour of this type of construction is that the heavy gauge coil need not be made of stainless steel in cases where this material would have to be used for coils inside a vessel.

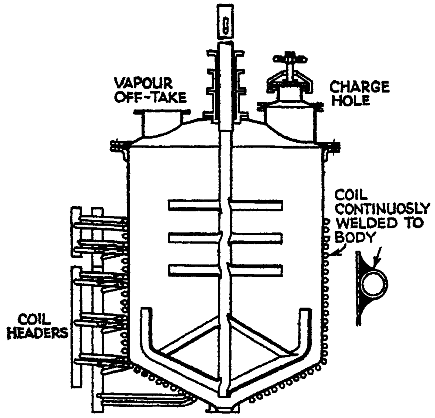


Fig. 2.

The use of high pressure steam in conjunction with the type of vessel shown in Fig. 2 is quite common in the German synthetic resin industry. Other uses for this system are in fatty acid distillation and the deodorising of vegetable oils.

Circulating organic liquids are in principle similar to those using hot water, and the chief liquids used for this purpose are heavy mineral oil and diphenyl oxide mixture, although chlordiphenyl and tetracresyl silicate have possibilities.

The principle of the system for oil circulation is similar to that for the diphenyl oxide system shown in Fig. 3. The oil usually used is a heavy mineral oil which is subject to a special dehydration treatment. It is pumped through a series of tubes set in a direct fired furnace and passed through the jacket of the reaction vessel or coils. The maximum operating temperature is about 315° C., but if operated continuously at this temperature, some decomposition will occur with deposition of sludge in the heating tubes. The system operates at substantially atmospheric pressure except for that necessary to overcome pressure drop caused by the circulation. At room temperature, the oil has a high viscosity and some time is required to heat up the system unless precautions are taken to keep the oil warm during shutdown. Cooling can also be carried out by the inclusion of a water cooled heat exchanger, but owing to the difficulty of abstracting heat from a liquid whose viscosity increases rapidly with fall of temperature the cooling effect is not very satisfactory.

The other common organic liquid used as the heat-carrying medium is a diphenyl oxide mixture consisting mainly of diphenyl oxide, the balance being diphenyl. Pure diphenyl oxide and diphenyl have melting points well above room temperature, but the addition of the diphenyl to diphenyl oxide lowers this to below 150° C., and thereby reduces difficulties caused by the solidification of the liquid. As the liquid boils at approximately 255° C. at atmospheric pressure, it is necessary to circulate it under pressure and a temperature of 360° C. requires a pressure of approximately 75 lb./sq. in. The equipment requirements are similar to those for a hot-oil circulation except that a closed instead of an open system is used. A typical arrangement is shown in Fig. 3.

The diphenyl oxide has a low viscosity and therefore gives good heat transfer co-

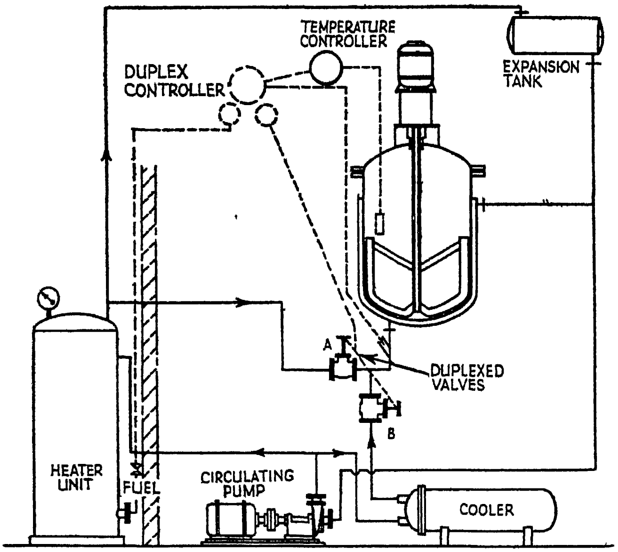


Fig. 3. Arrangement of plant for circulating diphenyl oxide-diphenyl mixture with automatic control.

efficients both when heating and cooling, provided steps are taken to ensure that it is in turbulent flow. With the set up shown in Fig. 3 it is possible to obtain rapid and close control of temperatures. By the control of valves A and B, it is possible to change over rapidly from heating to cooling and to obtain instantly any intermediate temperature of the circulating liquid between 150° C. and 370° C.

If a temperature of 370° C. is not exceeded, the diphenyl oxide mixture is perfectly stable and decomposition occurs.

The liquid is extremely penetrating and in view of its high cost, steps must be taken to avoid leaks. It is best to weld all possible joints and flange those which cannot be welded. The circulating pump has to be of special cast steel construction with water cooled glands and deep stuffing boxes with high temperature packing.

When it is desired to circulate the heat transfer medium through the jacket of the vessel, spiral baffles in the jacket space direct the flow and increase the turbulance of the liquid, leading to good heat transfer coefficients. With a liquid of low viscosity such as diphenyl oxide, it is possible to obtain flow well within the turbulent region with little pressure loss.

Chlordiphenyl and tetracresyl silicate are two other organic liquids suitable for use as heat transfer mediums, the former being stable up to 315° C. and the latter up to 370°C. They are both of relatively low viscosity at room temperature and have boiling points higher than the maximum temperatures of stability. These systems, therefore, operate at substantially atmospheric pressure as in the case of the oil circulation system.

Circulating organic fluids as heat transfer mediums are commonly used in the manufacture of alkyd and other synthetic resins. In the case of melamine resins, the higher temperatures required necessitate the use of diphenyl oxide mixture. Circulating hot oil systems are commonly used in the melting of bitumen. Other uses for this class of heat transfer medium include the heating of automatic injection plastic moulding presses.

The common material used for organic vapour heating is the mixture of diphenyl oxide and diphenyl, and in one system is similar to that used for the generation of steam in that a boiler generates the vapour. It is, however, essential that the boiler is of an all-welded construction and that it is designed for proper circulation of the liquid. As a general rule, it is preferable to arrange installations for gravity return of condensate, thus avoiding the use of return pumps. Due to the low latent heat of the vapour, it is not possible to use traps as in normal steam practice. Also for temperatures below 260° C., it is necessary to boil the liquid at less than atmospheric pressure so that gravity return or pumping of condensate is required.

Besides the boiler type of vapour generator, a system similar to that shown in Fig. 1 using a coil set in a direct fired brick furnace and arranged for the gravity return of condensate is often employed. One generator usually serves one vessel and except for an air vent, no valves are employed, the whole being welded together.

The vapour heating system can also be combined with effective cooling. To do this, it is necessary, after the heating period has finished, to close the vapour and condensate valves and circulate the liquid through the jacket from an independant closed cooling system equipped with its own circulating pump. At the end of the cooling period, the pump is stopped and the liquid allowed to drain from the jacket to a storage tank, after which the jacket is then ready for another heating operation.

Heating by means of condensing organic vapours is used in the distillation of fatty acids, manufacture of synthetic resins, heating of rolls, asphalt melting for waterproofed building paper, and the melting of nylon polymer in the spinning of nylon yarn.

Other Fluids

There are a number of other substances suitable for use as transfer media, *i.e.*, mercury, flue gases or air molten metallic alloys and fused salts. The latter are usually nitrate and nitrate mixtures, which can be melted by steam at 150 lb./sq. in. pressure and pumped through heat exchangers for introducing or removing heat as required.

It is convenient for the systems described above to be divided into two classes; those using the latent heat of the heat transfer medium, and those using the sensible heat and the problem of automatic temperature control is similar for the various fluids under each of these two headings.

In the case of heating by steam and organic vapours, the usual form of automatic control consists of an instrument to maintain a set pressure at the boiler, and a further instrument to operate a valve at the inlet to the heating vapour space, the latter instrument taking its impulse from the temperature of the material being heated. The controller on the boiler maintains a constant pressure of the vapour by operating a valve on the supply line of the fuel and can be of the " On-Off " type. Where no exothermic heat of reaction is evolved, this arrangement gives very close control of temperature.

To maintain a set temperature in cases where exothermic heat of reaction is evolved, cooling is required and with steam or other vapour systems it is necessary to close the vapour inlet and condensate valves and to circulate water or other liquid through the heat space. Unless complicated arrangements are made, it is difficult to give the correct amount of cooling to counteract the heat liberated. Thus where the exothermic heat is large, the entering temperature of the cooling medium would require to be lower than where the exothermic heat is smaller. For close control, the temperature difference between the heat transfer medium and the materials which are to be maintained at the set temperatures should be proportional to the rate of heat input or removal necessary to maintain the set temperaure. Unless complicated arrangements are made it is difficult, with steam or vapour heating, to arrange for water or condensed vapour to be circulated at the temperature to give just the right amount of cooling.

With jacketed vessels and other batch apparatus heated by a circulation system, there are probably very few applications of automatic instruments where control can be successfully carried out with one instrument only. Usually one controller is needed to measure and control the temperature in the jacketed vessel, which in turn resets a second controller measuring and controlling the temperature of the circulating medium. Fig. 4 shows one arrangement where the capacity of the circulating system is sufficient to allow the use of " On-Off " control.

With regard to the matter of choosing a system, it is necessary to consider the features which are essential for the purposes for which the plant is required. The chief points to be considered are:—

(a) temperature required
(b) rate of heating
(c) temperature control
(d) running costs

and the object should be to choose a system which gives the most satisfactory combination of these factors, with a reasonable capital cost.

For temperatures below 100° C., water jackets and steam under reduced pressure are usual, but in the case of the latter, a pump is required for condensate and air removal.

In the range of 100° C.-170° C., steam jackets or coils are almost universally employed except in cases where it is necessary to control the temperature during a strongly exothermic reaction. In this case the circulation of hot water under pressure in a closed system would be the most satisfactory. Steam jackets can be designed for water cooling and exothermic processes may be controlled by these means but for the reason explained under the section on automatic control, it has its limitations.

In some works, there may be available a steam supply at 300/500 lbs. sq in. and if the vessel to be heated is a high pressure autoclave with a thick inner shell, this high pressure steam may be used to give operating temperatures up to 230° C. With the more usual reaction vessel it would be uneconomic to design for these higher pressures.

For units requiring temperatures above 170° C., the choice lies between circulation system of organic liquids high pressure steam and organic vapour. The hot oil circulating method is the simplest and lowest in capital cost of these methods and does not require special constructions of plant as is required in the case of the other systems, but does not give as good heat transfer rates and has a limiting temperature of 315° C.

The use of chlordiphenyl in the place of oil has the advantage of giving higher heat transfer rates. The plant is similar in that the pressure on the circulation system is substantially atmospheric but the cost of chlordiphenyl is greater than that of the oil. Tetracresyl silicate has similar advantages over oil and is stable at temperatures up to 370° C. but it is not yet

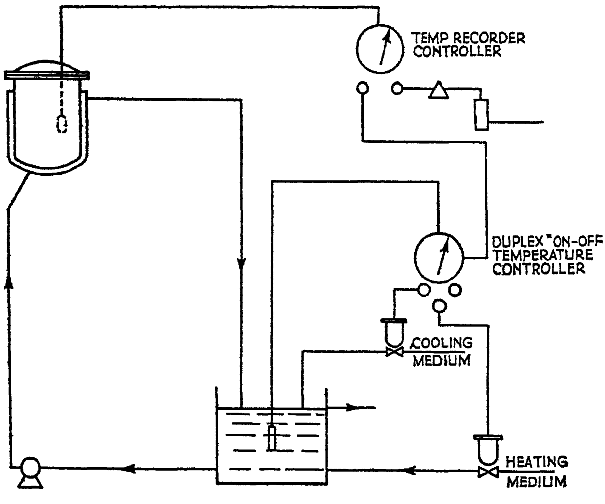


Fig. 4. Temperature control of batch process where capacity of circulating system is sufficient to permit use of " On-Off " control

available in sufficient quantities and in view of the difficulties in its manufacture, the price at which it will probably be sold is too high to justify its use as a heat transfer medium.

With the high pressure steam system, the maximum temperature is higher than with oil circulation, being about 330°, corresponding to a pressure of 129 ats., and gives better heat transfer rates and does not give sludging troubles. The system has a number of disadvantages in that each vessel usually requires a separate heating unit and the circulating steam cannot be used as the cooling medium, and where it is desirable that only the walls of the reaction vessel are used for heat transfer, it is necessary to subdivide this heat transfer surface into heating and cooling sections, with consequent loss of area for either heating or cooling. The use of the necessary high pressures also presents a certain risk.

Higher Heat Transfer Rates

For temperatures up to 370°C., systems using either circulating liquid diphenyl oxide —diphenyl mixture or its vapour are eminently suitable as a pressure of approximately 90 lb./sq. in. only is required. The condensing vapour gives higher rates of heat transfer than the use of the cirilulating liquid but owing to the degree of vacuum required, it is not so suitable in cases where it is undesirable for the temperature of the condensing vapour to be above 180°C. Under these circumstances, the circulating system has considerable advantages. Another application for the liquid phase circulation is for an installation comprising several jacketed vessels which vary in temperature requirements, from, say, 100°C. to 300°C., *i.e.*, one vessel may be at 100°C. while the others may be at 200°C. and 300°C.

Where little or no exothermic heat of reaction is involved, control of temperature can be very simply accomplished with the vapour phase but where exothermic heat of reaction may occur, close control of temperature can be more easily made with a circulating system as the temperature of the circulating liquid can be easily adjusted to that required for the removal of the heat to maintain a constant temperature in the reaction vessel.

For large installations where high rates of heat input are important the vapour phase system is to be recommended and as described previously, can be combined with a cooling cycle but the initial cost of this type of plant is comparatively high.

In many industries, the method of heating and cooling by means of circulating diphenyl oxide mixtures presents an economic solution particularly in sizes up to say, 4 therms/hr. since the capital cost of this type of heating and cooling system is less than the vapour phase system. Although the heat transfer coefficient of the condensing vapour is higher than that of the circulating liquid most of the resistance to heat transfer occurs in the layer of liquid adjacent to the wall and inside the vessel which is relatively viscous, and which is of course, present when using either vapour or liquid diphenyl oxide. It is, therefore, possible to obtain overall rates of heat transfer with the liquid form of heat transfer medium which are not appreciably less than with the vapour phase provided that the jacket space is correctly designed.

For temperatures up to 540°C., mercury is a good heat transfer medium, but in view of its high cost, and the risk occasioned by the leakage of the toxic vapour its use is restricted. Flue gases can be used for high temperatures but great volumes require to be moved for relatively small amounts of heat, temperature control is difficult and local overheating is liable to occur. Fused salts have much to recommend them for temperatures above those attainable by diphenyl oxide mixture and up to 540°C. They have been extensively used in the Houdry process for the cracking of oils and in the "Thermofor Kiln" for the regeneration of decolorising clays.

It will be seen that from the variety of factors enumerated above that no definite rules can be laid down for deciding on the system to be used for a particular purpose and that it will often be found that the same process is being carried out by different types of heating method. This is often due to facilities at the particular works and the relation of capital cost of the plant to the amount of production. Thus, a large production justifies the extra cost of a more flexible type of equipment. It is only by consideration of the circumstances of each particular case that the most suitable choice can be made.

Not Optimistic

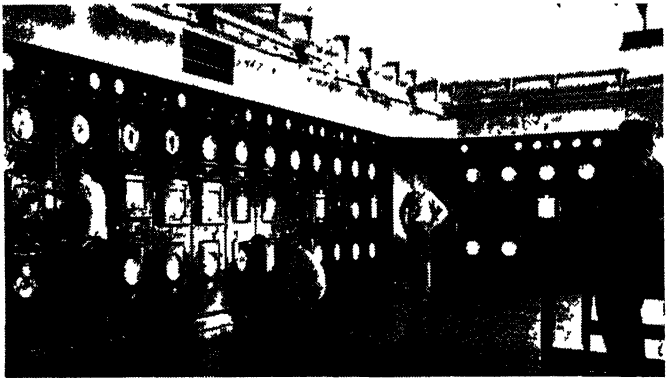
Professor M. H. L. Pryce, Professor of Theoretic Physics at Oxford University, speaking at the annual exhibition of the Association of Scientific Workers at Oxford last week, said that "a good part of a century" must elapse before atomic energy would be significant as a solution to world power problems. There were too many technical and laboratory problems as yet unanswered.

"If we continue our work along the usual lines we should require something like 70,000 tons of uranium a year to replace the other forms of energy," he said. "This means that the world could run its industries for a short time on the atomic energy and then they would be brought to a stop for lack of sufficient basic material."

Instrumentation in U.S. Refineries

AUTOMATIC CONTROLS REPLACING THE HUMAN FACTOR

SENSITIVE and versatile new instruments which guide huge quantities of petroleum through refining processes are bringing the mass production of gasoline and oil to the highest volume in history. Thousands of recording and control devices, using advanced electronics, pneumatics, and pyrometry, are being incorporated in modern refineries to step up production and to achieve lower costs.



Control room of Gulf's new refinery

An extraordinary "mechanical nerve system," measuring and automatically regulating speed, volume, pressure and heat in every refinery pipe and tower, is effecting these results. The system enables the handling of massive forces and volumes, which could not otherwise be controlled with the necessary precision.

Nerve centres of the system are large control rooms now built into major units, each containing as many as 500 instruments. Control points incorporated throughout the unit may be connected by pneumatic transmission lines The varying reactions of the process are conveyed from the outside instruments into the control house. Here recording and adjustment of the variations is performed under the eye of the chief operator, either automatically by the instruments themselves, by manual instrument control, or by communication with workers manning the installation.

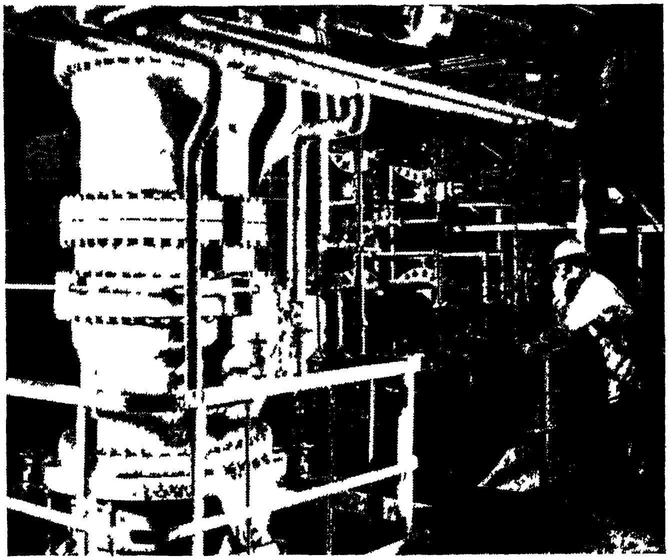
General view of refinery showing complicated maze of units

The pneumatic lines, which bring in the instrument responses and activate process adjustments, form an elaborate air pressure transmission system developed to eliminate hazard of fire or explosion from electric wiring. Where high speed recording is essential, low voltage electronic amplifiers are used to record temperatures. Automatic pre-alarms, alarms and shut-offs provide a high degree of safety.

The modern control house, exemplified by the U.S. Gulf Oil Corporation's new fluid catalytic cracking installation at Philadelphia, Pa., enables operators to " see " and cover complex operating units spread out over a large area. This, with the automatic process adjustments and quick response to the instruments, constituutes the great advance over early refining controls. During pioneer days it was often questionable whether a still could be kept operating up to 100 hours; to-day, giant, precision-directed units can run from six months to a year without interruption.

Among devices which have effected the change from small batch operation to mass production are modern level controllers which chart and manipulate the level of fluid in towers and stills; flow, temperature and pressure indicators, recorders and controllers; interconnected controls where valves are operated by different instruments in response to varying conditions; and special scanning graphic pyrometers which show a pattern of temperature at a glance.

These and other devices are constantly being improved by instrument experts. One foreseeable result of this progress is smaller control rooms as automatic operation improves. Many recording charts, it is expected, will be dispensed with or mounted on the works, leaving only signal and indicator to show the rare occasions where a process is running off schedule.



Giant 17-ft. valve in Gulf's new Philadelphia refinery

Canadian Salt Rise

AN increase in the price of its domestically-produced household and industrial salt is announced by the salt division of Canadian Industries, Ltd. The company estimated the increase will mean an addition of about 25 cents a year in salt costs for the average family. The cost of salt required to manufacture 100 lb. of butter or cheese will be increased approximately one cent, the announcement said, and cost of salt to cure 100 lb. of bacon will be increased by less than one cent.

" The step-up of salt prices was necessitated by an overall increase of approximately 50 per cent in the costs of fuel, labour and packages over the last six years," the announcement said. " Since the pegging of salt prices by the government in November, 1941, these mounting production costs have been absorbed entirely by C.I.L."

It added : " Salt price increases vary with the type of salt and package." In the new sale of prices, the accumulated increases in the cost of jute and cotton, which are imported materials, are reflected for the first time.

" As a result, salt in jute and cotton containers has advanced relatively more in price than salt packed in domestically-produced kraft paper bags.

Technical Reports

The following are among the latest German and Japanese Technical Reports, copies of which are obtainable from H. M. Stationery Office at the prices quoted.

CIOS XXXII—45. Gas turbine developments (1s. 6d.).

BIOS 1264. Wagner natural circulation boiler (32s. 6d.).

BIOS 1394. The Hansa Muhle continuous solvent extractor (1s. 6d.).

BIOS 1505. The production of high speed and other special alloy and carbon steels in Germany and Austria (14s.).

FIAT 649. Catalysts for the manufacture of phthalic anhydride and aniline. I. G. Farbenindustrie, A.G., Ludwigshafen (2s.)

FIAT 996. The commercial development and manufacture of synthetic hormones in Germany (15s.).

FIAT 1016. Miscellaneous dyestuff intermediates at I.G. Farbenindustrie, A.G., Leverkusen (5s.).

FIAT 1032. On Structure irregularity in the surface of ionic crystals (2s. 6d.).

*BIOS/JAP/PR/*829. Japanese fuels and lubricants, miscellaneous oil technology and refining installations (8s.).

BIOS 1385. The German hard metal industry (37s. 6d.).

BIOS 1415. Notes on the extraction of some base and precious metals from concentrates and residues (1s. 6d.).

BIOS 1455. Luminescent pigments at I.G. Farbenindustrie, Leverkusen, and Riedel de Haen A.G. (2s. 6d.).

BIOS 1478. Manufacture of polyvinylidene chloride (2s. 6d.).

BIOS 1497. Polyurethanes. Interrogation of Dr. Otto Bayer (I.G. Farbenindustrie, Leverkusen) (1s. 6d.).

BIOS 1498. Polyurethanes and synthetic resins. Interrogation of Dr. Otto Bayer (I.G. Farbenindustrie, Leverkusen) (2s.).

FIAT 999. Formaldehyde manufacture in the I.G. Farbenindustrie (2s.).

FIAT 1041. Polystyrene manufacture at the I.G. Farbenindustrie plant at Schkopau (1s.).

FIAT 1048. The production of zirconium oxide (1s.).

FIAT 1057. The manufacture of dextrines and cold water dispersible starches in Germany (2s.).

FIAT 1062. The Stuerzelberg process for manufacturing pig iron (3s.).

Libraries and Chambers of Commerce Supplied with C.I.O.S., B.I.O.S., F.I.A.T. and J.I.O.A. Reports

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Halifax Central Public Library, Belle Vue.
Huddersfield Public Library and Art Gallery.
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Ipswich Central Public Library.
Keighley Central Library.
Leeds Commercial and Technical Library.
Leicester Central Library, Bishop Street.
Liverpool Reference Library, William Brown Street.
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  City-Guildhall Library, E.C.4.
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  Edmonton Central Library, Lamb & Keats Memorial, Fore Street, N.9
  Hendon Public Library, The Burroughs, N.W.4.
  Ilford, Essex, Central Library, Oakfield Road.
  Islington Central Public Library, 68, Holloway Road, N.7.
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  Middlesex County Library, H.Q. Hanworth Road, Hounslow.
  New Cross Central Library, Lewisham Way, S.E.14.
  Patent Office, 25, Southampton Bldgs., Chancery Lane, W.C.2.
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HYDROGEN PEROXIDE FOR PROPULSIVE POWER

FROM time to time notices have appeared in the Press (*see* THE CHEMICAL AGE, January 4 and August 23, 1947) concerning the use of hydrogen peroxide for propulsion purposes. During the war, secrecy of activities necessarily restricted the revelation of details, but as investigators have dug deeper down into war-time German exploits in the field of science, more and more information has become available. Not all that is known about the use of hydrogen peroxide as a war fuel has been released, but enough information has been disclosed to enable scientists and researchers to put together some kind of story. Certain phases of the complete story are still restricted, but there are features of the use of this material for power production, particularly by the Germans during the war for V-bombs and for propelling airplanes and submarines, as revealed by Capt. Logan McKee, Chief of Design Branch at the Bureau of Ships, at a recent meeting of the American Society of Mechanical Engineers, which are not restricted and which it is felt would be of chemical interest. Capt. McKee has supplied some valuable background material, hitherto unavailable.

The Chemistry Involved

Hydrogen peroxide is normally manufactured at about 27 per cent concentration. If a higher concentration is required, and the Germans used a concentration of 80 to 85 per cent, it is distilled under low absolute pressure, starting at about 50 mm. Hg. and decreasing the pressure to about 30 mm. as the concentration is increased to 85 per cent. This may be compared with the use of hydrogen peroxide as a disinfectant, in which case the concentration is only about 3 per cent, the remaining 97 per cent being water. The Germans gave their 85 per cent concentration the name of " Ingolin," Professor Walter, Germany's foremost proponent of the use of H_2O_2, naming it after his eldest son, Ingo. It was also known as " T-stoff." In Germany, " Ingolin " was used sometimes as a mono-fuel or primary fuel, *i.e.*, using only the heat of dissociation of the H_2O_2 into H_2O plus O_2.

The heat of disassociation for 80 per cent concentration is roughly 1000 B.Th.U. per lb. The mixture, in that case, which approximates that used by the Germans, would be 75 per cent H_2O vapour (superheated steam) and 25 per cent O_2 by volume (63 per cent H_2O and 37 per cent O_2 by weight), and the mixture would be at 500° C. (932° F.) assuming that the liquid was supplied at 70° F. The Germans, however, sometimes used it as a secondary fuel, *i.e.*, all or nearly all of the free oxygen being further burned with a fuel such as decalene or methyl alcohol. The reasons for using the material as a secondary fuel were to take advantage of the larger heat release per pound of mixture, and because the cost per B.Th.U. obtained from the fuel is much less for that than from H_2O_2.

From the foregoing it will be noted that the heat of dissociation of H_2O_2 per lb. is about 1/19 of that of the heat of combustion of a pound of oil. The value of H_2O_2 is therefore its ability to furnish free O_2 when and where you want it. It has advantages over liquid or gaseous oxygen in that it is more easily contained and produces a lower flame temperature. As a general rule in the United States, prior to and during the war, H_2O_3 was not concentrated for commercial or military purposes at greater than 50 per cent, although some laboratory tests had taken it higher. The reason it had not been taken to higher concentrations, more because of expediency rather than the lack of ability, was because that unless certain rules are known and carefully observed, higher concentrations are violently unstable and, naturally, the dangers increase with the increased concentration. The Germans, however, were far more advanced in the subject than any other country. While the United States has been interested in the possibilities of hydrogen peroxide for years, chemists, for one reason or another, did not reach the point of taking advantage of its characteristics in the higher concentrations. At the present time it is concentrated commercially to a higher percentage than the Germans ever did, and to a greater degree of purity (only five parts per million impurities).

Characteristics of Hydrogen Peroxide

In the concentration used by the Germans the specific gravity was 1.37 at 32° F. It was colourless, or slightly yellow, and had a distinctive but not unpleasant odour. A 100 per cent concentration freezes at 20° F. and boils at 306° F. at atmospheric pressure, and its specific gravity at 32° F. is 1.46 plus. A peculiar thing is that 80 per cent H_2O_2 freezes at minus 11°F.; and 1 per cent at just under 32°F.; 60 per cent solution freezes at minus 70° F. The boiling point at atmospheric pressure has to be obtained by extrapolation as the material detonates before reaching the boiling point. Concentration is determined usually by taking its specific gravity, although titration gives a more accurate check. Impurity in the form of sulphuric acid throws off the determination of concentration by observations of the specific gravity, and this gave the Germans so much trouble that they learned to eliminate the H_2SO_4. After a stabiliser, or stabilisers (the Germans used oxaquiniline or phosphoric acid), is added it can be left in an open container without too rapid a loss in concentration. Concentration drops off rapidly at first and becomes progressively slower as time goes on, provided no unusual conditions are encountered, and provided, further, that the heat of decomposition is allowed to dissipate. The drop during the first month in storage is about equal to the drop to be expected for the remainder of the year.

Effect upon the Hand

Provided one's hands are clean, they can be put into a high concentration of H_2O_2 without any immediate sensation except a slight prickling. In less than one hour, however, the hand will look as if whitewash had dried on it. When that coating wears off, the skin will be bleached white. All except a few materials act as catalysts for H_2O_2, so if there is dirt under the fingernails or on the hands, a burn will result. The antidote is water, and the way it acts is to reduce the concentration quickly. With regard to materials that should be used for handling and storage, it is important that iron and copper be carefully avoided as they are catalysts. Stainless steel, 99.6 per cent pure aluminium, glass, ceramics, and certain synthetics can be used: the most widely used synthetic in Germany was polyvinyl chloride.

When the Germans first started handling and storing concentrated H_2O_2 they used many precautions which later proved unnecessary. The basic requirements were determined and carefully observed, and after a while they had no more fear of handling it than they had of handling gasoline. In storage the first indication of instability of H_2O_2 is a rise in temperature to the danger point of 140°F. When that happened, the H_2O_2 was dumped into water by the Germans. In the early storages there were cooling coils in the tanks and a sprinkling system above them, but experience showed that they were unnecessary. On noting a rise in temperature, more stabiliser was added. By far the most fundamental rule in handling concentrated H_2O_2 is to have fresh water instantly available for diluting any spilled concentration. Almost without exception, when the concentration spills a fire starts. All that is needed to extinguish the fire is to reduce the concentration below 78 per cent, provided, of course, that no large amounts of combustibles are in the area. The reason that the fire starts is because there are usually some small amounts of combustibles present, such as grease, paint, wood, or cloth on which the H_2O_2 spills. The dirt on the combustible materials acts as a catalyst; heat of dissociation of the H_2O_2 raises the temperature of the combustibles to their ignition point, and the free O_2 is available to maintain the combustion. A little dilution of the H_2O_2 keeps the heat of dissociation below the auto-ignition temperature of the combustibles. The Germans kept water in the bilges of the engine rooms of their H_2O_2-driven submarines to reduce the concentration of any spilled H_2O_2. The men who handled the concentration wore scrupulously clean overalls, boots and gloves made of polyvinyl chloride.

Towards the end of the war, Germany had a capacity for manufacturing about 3000 tons a month, which was not nearly the amount she wanted. It required the services of about 3000 men to do the manufacturing. Germany's largest hydrogen peroxide manufacturing plant was well hidden in the Harz Mountains and was not located by U.S. Intelligence until after the war.

The utmost care has to be used in the manufacture and cleaning of storage tanks which are carefully gas-welded so as to leave no possibility of H_2O_2 seeping into crevices or under the edges where plates are lapped. Welding rods must be carefully selected in order to obtain alloys free of copper and an oxidising flux is used. After welding, the interior of the tank is cleaned and polished, treated with 10 per cent nitric acid, washed, painted (or filled) with 20 per cent solution of caustic soda, washed, treated with 10 per cent nitric acid solution, washed, and then the inside coated with wax, the principal purpose of which is to fill any small holes or crevices which may exist. The shape of the tank is influenced in the effort to get as small a surface-volume ratio as possible. After the tanks are ready, H_2O_2 is put in and carefully watched for two weeks. If undue decomposition was noted, the Germans would empty the tank and the interior would be treated again. Usually, 10 per cent of the interior is left empty, as a gas space.

German Use of H_2O_2

The Germans used H_2O_2 to launch V-1 bombs, to drive fuel pumps in the V-2 bombs, to drive torpedoes, ME 163 and 262 airplanes and submarines. Only the heat of dissociation was used for the V-1 and V-2 bombs. It was a rather expensive use of energy, but was so positive in action that its simplicity and reliability, the Germans thought, were worth the cost. Airplane performance with the use of this fuel was astounding and the thrust from the rocket engine corresponded to that of a 3700-h.p. conventional-type engine.

The torpedo drive was somewhat similar to the submarine drive. In the former, a liquid catalyst and fuel combined (Helmann) were used. After two or three seconds, decalene was admitted and the Helmann shut off. Decomposition of H_2O_2 was then accomplished by heat. Temperature in the combustion chamber was maintained at above 1800° F. The catalyst chamber and combustion chamber were combined, resulting in a dangerous situation, as the arrival of the three liquids had to be accurately co-ordinated. A serious explosion would result if any of the liquids was off-time, and it is said that about one out of each 100 torpedoes was wrecked in this fashion. The performance characteristics were much superior to those of any other torpedo and they were essentially wakeless.

" Schnorkel " Breathing Device

When surface forces overwhelmed the German type 7C submarine, the Germans realised that in order to cope with U.S. anti-submarine forces, they would have to go to a true submarine, instead of a surface ship which could be submerged, and that to make an attack and then escape it would be necessary for such a submarine to have high underwater speed. Their first and most important development was the underwater breathing tube or " Schnorkel." It permitted them to make a war patrol without once coming to the surface.

Then, in the summer of 1943, they conscripted a group of eminent designers and technicians and assembled them in a little town in the Harz Mountains. There they produced the much-discussed type 21 boat. It was a completely different submarine and would have been very effective had the Germans not made one fatal error in their design. Their hydraulic system was so complicated that they could not get it to work before the war ended, although they had built about 120 of these boats by that time. Type 21 had a surface displacement of 1600 tons, a surface speed of 15.5 knots and a submerged speed of 16.5 knots for one hour. It obtained its high underwater speed by the use of large battery power and a battery with very thin grids, 0.160 in. thick.

At this time, Walter, who had been experimenting with H_2O_2 since 1935, was able to speed up the acceptance of his submarine. Before the war, he had built and operated an 80-ton experimental H_2O_2 submarine and, in accordance with his design, it realised some 25 to 26 knots submerged speed. The Germans were never able to get very far with the practical application of H_2O_2 submarines because there was never enough hydrogen peroxide to permit them to operate. The last word in submarine design was to have been the type 26 Walter boat. It was under construction when the war ended and was to have been of 900 tons surface displacement, 11 knots surface speed and 24 knots submerged speed. It had ten torpedo tubes but no spare torpedoes. The hydrogen peroxide engine (it had only one shaft) was rated at 7500 h.p.—but Allied bombing forces never permitted the Germans to get the engine assembled.

There is a so-called triple feed pump which pumps H_2O_2, diesel oil, and water. The Ingolin pump parts, piping, and catalyst chamber are stainless steel. The first position on the starting wheel allows only Ingolin to be pumped. Ingolin reaches the catalyst chamber where it sprays on porous porcelain stones on which are fixed calcium, potassium, or sodium permanganate. The Ingolin breaks up into steam and O_2: 75 per cent steam by volume, at a temperature of about 930° F. The steam and O_2 mixture go to the combustion chamber, and soon after it reaches that point the cooling water is allowed to circulate. The water makes two passes through the combustion chamber water jacket and then sprays into the turbine working fluid. Soon after the cooling water is admitted, decalene is allowed to spray into the combustion chamber.

Automobile Spark Plug

Within the combustion chamber, the temperature is above the auto-ignition point, but an automobile spark plug in the combustion chamber is energised to assure ignition. Danger of explosion exists in the event of ignition failing. A proportioning device admits water, Ingolin, and decalene in a ratio of approximately 12 to 9 to 1. Flame temperature in the combustion chamber is about 4000° F. The water is sprayed into the combustion chamber in an amount to reduce the temperature to the desired degree. The Germans used approximately 1020° F. for their turbine working fluid. Working fluid is now about 94 per cent steam by volume and 85 per cent by weight. It goes through what amounts to a conventional steam turbine, operating at 14,000 r.p.m., and into a contact-type condenser where the steam is condensed.

The machinery installation is not quite as simple as the above might indicate. The turbine has the same problem of shaft-glad-sealing as any other steam turbine. It is water-sealed with a glad leak-off and leak-off condenser. There are three auxiliary lubricating-oil pumps which are used for starting only. When running, lubrication is accomplished by pumps driven

(*Continued on page 414*)

Synthetic Diesel Fuel Oils

RESULTS OF RECENT WORK

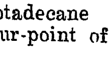
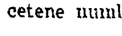
DURING the past few years a considerable amount of work has been done in Russia on aircraft engine fuels, especially on the synthesis of diesel fuels or hydrocarbons of low pour-point (−50 or less) and low-or medium cetene number in the range of 20-60. Among the principal investigators in this field have been A. D. Petrov and coworkers, and a summary of their work has been published in *Izvest. Ak. Nauk SSSR* (Otdel. tekh.), 1946 (4) 543-552 (*Bull. Acad. Science SSSR, Tech. Sect.*), including two tables giving the pour-points and cetene numbers of a large number of hydrocarbons of the paraffin and olefin series C_{12}-C_{21} and of the naphthenic and aromatic series C_{10}-C_{26}.

Since 1938, when these studies were commenced, more than sixty hydrocarbons have been prepared by various methods including those of Wurtz, Fittig, Friedel and Kraft and Forskov-Babayan. Special attenton was given to the relationship between structural change, including increased molecular weight, on such properties as pour-point and anti-knock.

Many Isomers

The number of possible isomers in the two series named above is of course extremely large—tetradecane alone has more than 1800—but for the particular purpose in view, aircraft engine fuel synthesis, it is necessary to consider only a comparatively limited number in the low pour-point and medium cetane number range, where nevertheless there is still a large number.

The authors claim that the synthesis they have so far carried out, demonstrated the possibility of preparing synthetic aviation fuel of a quality superior to that obtained by the usual cracking and distillation of crude petroleum.

Considering first the aliphatic or iso-paraffin series, interest centres mainly in those with the most numerous branching forms, and in those with one or two side chains in or near the centre of the molecule. It was shown that the larger the number of side chains the lower is the pour-point. An interesting structural type is that of the T form. For example 7-hexyl-pentdecane $C_{21}H_{44}$ or structurally  $C_6\text{—}\underset{\displaystyle C_6}{\overset{}{\underset{|}{C}}}\text{—}C_8$ has a pour-pour of −61 and a cetene number of 95, while 9-heptyl heptadecane $C_{24}H_{50}$ or  $C_8\text{—}\underset{\displaystyle C_7}{\underset{|}{C}}\text{—}C_8$ with a pour-point of −27 has a cetene number of 100.

Although lowering of pour-points is often accompanied by reduced anti-knock properties, this can be adjusted to a certain extent by using a mixture of these with iso-paraffins of higher molecular weight, of which the authors quote examples.

In the lower members of the paraffin series, *i.e.*, C_{12} to C_{19}, it is preferable to use the slightly branched paraffins with one side chain, as the introduction of a second side chain markedly reduces the anti-knock properties. In regard to those above C_{19}, only those with two side chains have low pour-points; but owing to their higher molecular weight they are fairly satisfactory from an anti-knock point of view—except those of symmetrical form, such as dibutyldecane or tetrabutyl-ethane. It was found that the introduction of a double bond lowered the anti-knock chracteristic much less than the inclusion of a side chain.

Although aliphatic hydrocarbons of normal structure and many of the aromatics exhibit a close relationship between the diesel index and the cetene number, the iso-paraffins are not characterised in this way. It is therefore recommended that, in determining the quality of the synthetic iso-paraffins as fuel, chief importance should be attached to the cetene number as found by the Waukesh apparatus or Neumann bomb. It is important to mention also that the synthesised iso-paraffins are distinguished not only by low pour-points but by relatively low temperatures of self-ignition, and can thus be ignited under low compression. Many of them will not oxidise readily, but this shortcoming can be easily remedied by the addition of suitable oxidising agents, *e.g.*, peroxides or the like. Moreover, owing to their low viscosity they can be used if necessary with the higher members of the series, C_{21} or beyond. The upper limit for possible application of the aromatic hydrocarbons, however, is much lower.

Aromatic Compounds

Turning to the aromatic compounds the monoalkyl-benzenes within the C_{12}-C_{21} range, with branched side chains, have sufficiently low pour-points; but only those of C_{16} and higher have satisfactory anti-knock properties. The lower members of the normal monoalkyl benzenes, below C_{16}, have fairly good anti-knock qualities but at the same time have rather high pour-points. As to the monoalkyl naphthalenes, these have lower anti-knock properties than the alkyl benzenes, but also lower pour-points.

Hydrogenation of the benzene ring increases the cetene number by 9 or 10 points,

(*Continued on p.* 400)

MODERN COAL GASIFICATION METHODS*—II

by DR. D. T. A. TOWNEND

A NUMBER of possible applications of the results have presented themselves and their general assessment is being made by the Gas Research Board. Particular consideration is being given to the possible advantages of pre-treatment of the fuel, and developing continuous—as distinct from intermittent—processes. Further, the catalytic synthesis of methane from water gas has been successfully achieved as an independent process, and it may well find some place in the ultimate possible schemes.

The Winkler Process

The Winkler producer was proposed in 1925 as a means of processing brown coal fines without the need for an intermediate briquetting stage which would have been necessary before they could be used in a normal gas generator. The body of the producer is a tall vertical steel cylinder 65 ft. high and 18 ft. in diameter; a flat grate forms the bottom and through its slot is led the blast. The fuel bed, 3 to 5 ft. in depth, is not stationary but is kept in a constant state of incipient motion by the passage of this blast and its top surface has the appearance of a boiling liquid which gives this type of fuel bed its usual name, a "boiling bed." Actually what is seen is a multitude of small gas channels which are allowing the gas to pass through and it is at once clear that these channels must not be self perpetuating, *i.e.*, the fuel surrounding any given channel must always be able to collapse so that the channel may re-form elsewhere. Thus, a coal with any caking property could not be used in a boiling bed. As will be seen, the coal, though fine, should be closely sized in order to minimise the inevitable carry-over which seemed to vary from 20 per cent to 50 per cent of the total coal feed, depending on the closeness of the sizing.

The large volume afforded above the fuel bed by the tall cylindrical generator casing is made use of to gasify the carry-over in suspension with the aid of a secondary oxygen blast. The rating *i.e.*, fuel converted per sq. ft. of grate area was from 1½ to 3 times that of a normal make and blow gas generator *i.e*, about 40 tons/hr. normal rate on a grate about 18 ft. in diameter giving 180,000 ft. 3/hr. of water gas. The percentage of oxygen in the oxygen steam blast was usually about 20 per cent of the total but could be as much as 50 per cent owing to the operation of the generator not being limited as is the case with the mechanical grate type, by having to avoid fusion of the ash and consequent clinkering.

The ash apparently tended to segregate by reason of the incipient motion of the bed and was removed by a conveyor screw diametrically opposite to the feed screw. About twenty Winklers have been reported in industrial operation for synthesis gas production, Leuna, Zeitz, Böhlen and Magdeburg having three large units each and Brüx in Czechoslovakia having six.

The method of ash removal in a producer has always been a dominating feature of its design and with oxygen blasts, it was natural that slagging producers should be tried where the ash was handled in the molten state. While there were a few slagging producers of simple construction in operation at Leuna which gave a gas high in CO and low in H_2, the Thyssen-Galocsy producer is of the greater technical interest.

While the producer, like all other slaggers, resembles a blast furnace in appearance it differs from the normal in that three rows of tuyeres are provided. Through the bottom row is blown a mixture of oxygen and recycle water gas, in order to give very highly superheated steam as a product of combustion. This rises to combine with the main blast which is led through either of the two upper rows so that the water gas reactions may proceed at a peak temperature of 1600°C. approx. The main blast consists mainly of oxygen with enough additional steam to bring the final product composition to the desired hydrogen and carbon monoxide content. Galocsy claimed for this method of operation that a good performance on steam decomposition could be obtained without resorting to excessive temperatures.

Leuna Engineers Critical

Nevertheless, it cannot be said that to produce steam by recycling gas and burning it is, on the face of it, profitable and the process seems to have been adversely criticised especially by the Leuna engineers who obtained much the same type of gas on their simpler producer with the same or even better oxygen efficiency. This latter figure is the main criterion of performance of the slagging producer on account of the high percentage (circ. 60 per cent) of oxygen necessary in the resultant blast and on account of the inevitably greater heat losses to be expected with this type.

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*The first part of this article appeared in our issue of September 13th.

Notwithstanding the great interest shown in novel methods of gasification by the Germans, it must be stated, in order to obtain a proper prospective in these matters that in the carbonisation, synthesis gas and town gas fields the greater bulk of the gases was made by the traditional methods though there is evidence that the newer plants, *i.e.*, those whose construction began about 1939, tended to use either the Lurgi, Winkler generator or to some extent the more developed gasification retorts such as the Pintsch Hellebrand.

In assessing the Lurgi, Winkler and slagging producers on their German performance, it may be stated that none of them " swept the board " for general use as a gas generator. The Lurgi came nearest to this degree of success as a means of completely gasifying brown coal to give a 500 B.Th.U. city gas. Its cost was about the same as that of gas produced in the normal way by using the more expensive bituminous coal but this makes no allowance for the Lurgi gas being available at high pressure for convenient long distance distribution. The oxygen usage was minimised by preheating the steam for the blast to 500°C. (which is near to the safe limit at 20 atmospheres pressure) so that it amounted to 7 per cent by volume of the blast. About 45 per cent of the steam input was converted to hydrogen, the remainder being lost thermally in the coolers.

Cheap Fuel

The attractive feature of the Winkler was its ability to use an otherwise unusable fuel available often at a merely nominal charge. Thus, a low carbon efficiency, with 25 per cent lost and collected in cyclones, could be tolerated but it should be noted that Sabel of the Leuna works who had charge of the hydrogen production claimed that the Winkler did not produce hydrogen as cheaply as the " make and blow " type of plant. Further, in spite of the high grate rating mentioned above the plant considered with all accessories was just as bulky for its output as the traditional make and blow units. The slagging producers are chiefly remarkable for their ability to produce a gas of high CO and low hydrogen; they were even employed to give a gas containing over 90 per cent of CO using CO_2 instead of steam. As their thermal efficiency was lower, this affected their oxygen consumption per unit volume of $CO + H_2$ produced and hence their German cost. These German price considerations, however, are not applicable to this country where coal and labour costs are much more predominant. Some rough re-editing of the German figures carried out at B.C.U.R.A., give a different picture of the relative advantages of the processes. Briefly, the conclusions which appear are that (a) oxygen costs are not a dominating and critical figure, especially in view of recent advances in oxygen production, (b) coal costs form the dominating factor and if a process can use a readily available coal which is suitable but which is not greatly competed for, then an economically attractive case may possibly be made out.

I am greatly indebted to my colleague, Dr. G. W. C. Allan, of the British Coal Utilisation Research Association, for invaluable assistance in the preparation of this address.

(*concluded*)

(*Continued from p.* 398)

while the effect of hydrogenating the naphthalene nucleus is even greater in this respect. Not only does it lower the pour-points so that they are lower than those of the hexahydro derivatives of the mono-alkylbenzenes, and the cetene numbers are higher. Generally it may be said that low-temperature hydrogenation increases the possibility of preparing mixed hydrocarbons as satisfactory aircraft engine fuel, *e.g.*, mixtures of monoalkyl-benzenes and decahydro derivatives of the corresponding naphthalenes, combining the high anti-knock properties of one group with the low pour-points of the other; and the same might apply in still higher degree to the branched paraffin and olefin hydrocarbons referred to above.

From their experience with the Neumann bomb method of determining the cetene numbers the authors conclude that this is sufficiently accurate, and the results compare very well with those obtained by Garner and others with the Waukesha apparatus. They further conclude that these studies of change in properties of synthesised hydrocarbons with increase in molecular weight and other structural changes form a valuable basis for preparing high-grade engine fuels.

ST. ROLLOX ANNIVERSARY

About 500 workers from the St. Rollox I.C.I. factory in Glasgow sailed down the Clyde on the *Queen Mary II* on September 11 to commemorate the 150th anniversary of the works foundation. Founded in 1797 by Charles Tennant for the manufacture of bleaching powder, the factory later turned to the manufacture of alkalis. Within 40 years of its foundation it had become one of the largest chemical manufacturing concerns in the world, producing all chemicals allied to the heavy acid and alkali industry of that period.

The St. Rollox factory, now operated by the General Chemical Division of Imperial Chemical Industries, still operates on the same site that it occupied 150 years ago.

Fourth Radioactive Series

Discovery by American and Canadian Scientists

THE discovery of the fourth radioactive series of elements, the ($4n + 1$) series, has been announced in simultaneous communications by two research teams who reported results of parallel work conducted in American and Canadian radiochemical laboratories. According to a report in the August 11 issue of the *Chemical and Engineering News*, the new series, called the neptunian series, from the name of its longest-lived member, does not occur in nature. A large portion of it was revealed from studies of the chain of decay products from U^{233}, which is obtained only in the cyclotron and from thorium in conjunction with the uranium pile.

The American work was done at the metallurgical laboratory, University of Chicago, by a group headed by Glenn T. Seaborg, who is now director of chemistry at the radiation laboratory, and at the University of California, Berkeley. The Canadian work was done at the Montreal Laboratory of the Division of Atomic Energy, National Research Council of Canada. The group, several members of which are now located at Chalk River, Ont., includes A. C. English, T. E. Cranshaw, P. Demers, J. A. Harvey, E. P. Hincks, J. V. Jelley, and A. N. May.

The naturally occurring radioactive elements comprise three series, two of them named from the longest-lived members. The thorium series starts with Th^{232} and is termed the $4n$ series. because the atomic weights of its members are evenly divisible by 4. This series terminates in Pb^{208}.

Uranium Series

The uranium series starts with U^{238} and is termed the ($4n + 2$) series. It includes U^{234}, thus accounting for two of the three naturally occurring isotopes of uranium. This series also includes Ra^{226} and ends with Pb^{206}.

The ($4n + 3$) series starts with U^{235} but is called the actinium series because at the time it was named the isotopes above actinium were not known. Protoactinium is the second member of this series, actinium the third. It ends on Pb^{207}.

At various times in the past, a fourth radioactive series, the ($4n + 1$), was postulated, but none of its members were ever found in nature. The reason becomes apparent upon examining the half-lives of the members of the recently discovered series.

The age of the earth is generally considered to be about 2 thousand million years. Therefore, only radioactive elements with lives of this order of magnitude could be in existence at the present time unless they are derived from the decay of longer-lived antecedents. Thus the half-life of the Th^{232} is 14 thousand million years, that of U^{238} is 4.5 thousand million years, and that of U^{235} is 0.7 thousand million years. But the half-life of Np^{237}, the longest-lived member of the ($4n + 1$) series, is only 2.25 million years. So the period of the earth's existence is equivalent to 1000 half-lives of this isotope. Therefore, the discovery of this series awaited the artificial production of its members in the cyclotron and pile. The work reported in the above communications emphasised the study of decay products from milligram amounts of U^{233}, which is an α-emitter with a half-life of 163,000 years. The ($4n + 1$) series includes the two recently named elements, francium (number 87) and astatine (number 85). Unlike the other three series, it ends on an isotope of bismuth. It also differs from the other series in not containing a rare gas, or emanation, member.

Newly Discovered Elements

Upper members of this series include several of the recently discovered transuranium elements which have been described previously. These upper numbers are .

$${}_{94}Pu^{241} \xrightarrow{\beta} {}_{95}Am^{241} \xrightarrow{\alpha} {}_{93}Np^{237} \xrightarrow{\alpha} {}_{91}Pa^{233} \xrightarrow{\beta} {}_{92}U^{233}$$

"Collateral" members of this series include Th^{233} and U^{238}, which also have been described previously. The decay products of U^{233} trace a major part of the new series. They were announced in the above communications as follows:

Species	Type of Radiation	Half-Life
${}_{90}Th^{229}$	α	7,000 years
${}_{88}Ra^{225}$	β	14 days
${}_{89}Ac^{225}$	α	10 days
${}_{87}Fr^{221}$	α	5 min.
${}_{81}At^{217}$	α	0.02 sec.
${}_{83}Bi^{213}$	α (2%), υ (98%)	46 min.
${}_{84}Po^{213}$	α	3×10^{-6} sec.

The remaining members of the series, both of which were previously known, are β-emitting Pb^{209}, which has a half-life of 3.3 hours, and stable Bi^{209}.

The 2 per cent α-branching at Bi^{213} results in the formation of Tl^{209}, but the low activity of this isotope precluded measurement. It is postulated that it decays with β-emission to Pb^{209}.

The Canadian authors reported that the α-emitters of this series are found to lie on a good straight line in a Geiger-Nuttall plot, with the exception of Po^{213} which falls well below the line. This line lies between and is parallel to those representing the $4n$ and the ($4n + 3$) series.

NEW RESISTANT METALS AND CERAMICS

DEVELOPMENT FOR JET AND ATOMIC PLANTS

A NEW group of "super metals" and ceramics soon will be available for the turbo-jet, rocket and atomic energy power plants, Dr. Clyde E. Williams, director of Battelle Memorial Institute, Columbus, Ohio, told the American Society of Mechanical Engineers at its current meeting in Salt Lake City, Utah. They will withstand higher temperatures and pressures than any materials now available, he said, and so will offer unequalled potentialities for power generation.

Recalling that the gas turbine would not have been possible without the highly alloyed materials developed in the past decade, Dr. Williams said that materials had to be developed to withstand high stresses and temperatures up to 1500° F. "Now," he said, "engineers are pushing beyond this figure and are asking for materials to withstand 1600° F. and stresses as high as 20,000 p.s.i. When war demands required the rapid development of alloys for gas turbine parts, we were ready. Thanks to the skill of the design engineer and to the success of the metallurgist, the aircraft industry was able to supply the superchargers for the engines of high altitude fighters and bombers and the gas turbines for our jet planes."

Alloys in Use

"For the supercharger, disc materials must withstand a temperature of 1100° F. under high stress. For this purpose, chromium-nickel-cobalt-iron alloy strengthened with such other elements as molybdenum, tungsten, columbium or titanium is used. The alloy used for discs contains 16 per cent chromium, 25 per cent nickel, and 6 per cent molybdenum, the balance of iron.

"The gas turbine blades used in superchargers and jet engines are subjected to temperatures of 1500 to 1600° F. and the metal sometimes reaches a temperature of 1500° F. To secure stability, still more highly alloyed materials must be used and some are practically iron-free. The strongest materials suitable for precision casting are the cobalt-base alloys containing 40 to 70 per cent cobalt and such other additions as chromium and molybdenum or chromium, nickel, molybdenum, tungsten and columbium.

"Another series of alloys, based on chromium, with upwards of 50 per cent of this metal, is showing great promise. An example is one that contains 60 per cent chromium, 15 to 25 per cent molybdenum, the balance of iron. This alloy must be smelted and cast in a vacuum. In preliminary tests it showed up better than the cobalt-base alloys and gave promise of permitting safe use of still higher stresses.

"The gas turbine has met with so much success in aircraft, and the opportunity for securing metals to withstand high temperatures for long periods of time is so promising that this means of power generation will be extended to numerous other fields. Three gas turbines for ship propulsion are under construction for the (U.S.) Navy and the (U.S.) Maritime Commission. Stationary power generation units run by gas turbines of 5000 to 10,000 h.p. are in the planning stage.

"Judging from the tremendous advancement made during the war, using the present status of materials and power as a basis, the possibilities for the future are simply staggering."

In the use of atomic energy, practical work was under way involving the generation of steam and electrical power in stationary plants, Dr. Williams said, but many problems remained to be solved by the engineer. "Radio-active fission products," he said, "must be frequently removed from the uranium and plutonium and the nuclear reactor must be enclosed in a thick shield to protect personnel from harmful radiation. This makes the problem of atomic propulsion of any vehicle a most difficult one, that of ship propulsion being the least difficult because of the possibility of utilising water as a protective shield."

Future of Ceramics

"The high-temperature 'super metals' developed for the gas turbines and improvements on these yet to come will be useful, but to meet the highest temperatures these will not suffice and ceramic materials will be called for.

"These ceramic materials made up from the most highly refractory substances, such as oxides of beryllium, aluminium, magnesium, zirconium, and so on, are the only known materials that will not melt or burn up at such temperatures. They may be used as coatings for metals, as structural combinations with metals, or as individual parts.

"One difficulty involving the use of ceramic materials is their relatively poor mechanical properties compared with metals."

American Chemical Notebook

From Our New York Correspondent

THE estimated total bookings of fabricated structural steel for July, 1947, amounted to 150,260 tons representing an increase of 45.5 per cent over the bookings of the preceding month, according to reports received by the American Institute of Steel Construction, Inc. The bookings for the first seven months of the year, the Institute reported, amounts to 908,313 tons, a gain of 7.7 per cent over the 843,752 tons booked in the same months in the averaged five pre-war years 1936-1940. Shipments for the month of July, reported at 156,102 tons, showed an increase of 22.5 per cent over the same month in the five pre-war years, while shipments for the seven months were 20.3 per cent greater than for the same months in the pre-war years.

* * *

At the annual conference of the International Association of Fire Chiefs which was held this week in New York at the Hotel Pennsylvania it was announced that attempts will be made to safeguard the future handling of ammonium nitrate, which is needed in large quantities as commercial fertiliser throughout the world. The fire chiefs adopted a resolution commending the action of Fire Commissioner Frank J. Quayle of New York for his recent ban on handling ammonium nitrate cargoes within the confines of New York harbour. Before the conference came to a close, Matthew M. Braidech, director of research of the National Board of Fire Underwriters, announced that Major-General Phillip B. Fleming, general chairman of President Truman's conference on fire prevention, has called a meeting for all groups interested in the problem of ammonium nitrate handling. The meeting was held in Washington, D.C., recently.

Although urging the fire chiefs to attempt to "force drastic action to prevent such tragic and unnecessary losses" as that suffered last April at Texas City, Texas, Mr. Braidech pointed out that there is no intention "to obstruct the commercial exploitation of this magical fertiliser." He said that "the Government has a $200,000,000 investment in a chain of ten nitrogen-fixation plants" throughout the Middle West gas and oil country, with a capacity of 1,500,000 tons annually.

Meanwhile at Leonardo, New Jersey, stevedores began the loading of an Army-chartered victory ship with ammonium nitrate fertiliser destined for overseas. Local residents who signed petitions protesting against the loading and handling of ammonium nitrate at the Earle Navy Ammunition Depot are still awaiting word from Washington about their appeals. At the Navy depot the ammonium nitrate is being loaded aboard the victory ship in 100-pound paper bags.

* * *

A new chemical insecticide called methoxychlor has proved to be 40 times less toxic to warm-blooded animals than DDT, Dr. W. H. Tisdale, director of the pest control research section of the Grasselli Chemicals Department of the Du Pont Company told a gathering of the International Apple Association meeting in Detroit, Mich. Methoxychlor, technically called bis (methoxyphenyl) trichloroethane, which is an analogue or close relative of DDT, is being manufactured in limited quantities by the Du Pont Company.

"There should be no danger involved, according to the available toxicity records, in the use of this product as an insecticide for fruit and vegetable crops," Dr. Tisdale said. "It is superior to DDT for the control of flies and Mexican bean beetles. It is not equal to DDT for the control of the codling moth. Although sufficient comparative data are not available to give an accurate picture, the indications are that the methoxy analogue of DDT will control most of the fruit crop pests controlled by DDT."

Dr. Tisdale said that recent experience with DDT had shown it to have a wider range of efficacy than was originally anticipated. At the same time, he warned that DDT "is not a cure-all nor is it as harmless to warm-blooded animals" as the earlier literature on the subject had indicated. He stressed the importance of using DDT in "formulations that have proved effective and safe to plants through experimental trials."

* * *

Another good augury in the drive for Anglo-U.S. trade was the announcement made this week by C. D. Jackson, vice-president and managing director of Time-Life International that Time, Inc., the weekly newsmagazine, will shortly undertake an extensive nation-wide survey on the state of markets for British goods in the U.S. In an attempt to discover the present and future possibilities for British goods here, the magazine will poll about 650 top-buying executives in the U.S. on the subject of their buying plans with especial reference to British merchandise. The survey will be based on questions suggested by leading British exporters, according to Mr. Jackson.

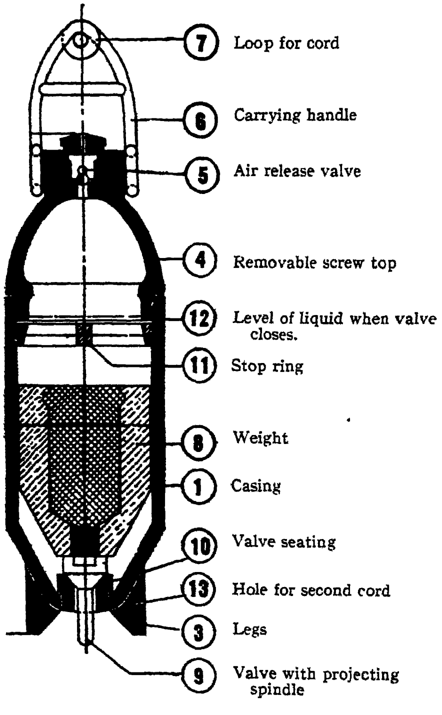
Tank Bottom Sampler

Ingenious Instrument

A DEVICE that may well attract the attention of many chemical manufacturers is the neat, impressive tank bottom (and intermediate depth) sampler displayed by K.D.G. Instruments, Ltd., at the Engineering and Marine Exhibition. Only 2¾ in. in diameter and about 8½ in. high, the apparatus is suspended in the liquid by means of a cord. When the valve's projecting spindle touches the tank bottom, the inlet valve opens to admit the liquid thus displacing the air, which is released through the air valve until a predetermined pressure equilibrium is established in the container. The sampler is then drawn up by the cord which has the effect of closing the inlet valve. The contents can be removed by unscrewing the tapered top.

Intermediate Sampling

For intermediate depths, an additional cord is attached to the sampler by means of a small hole in one of the legs. By this means the apparatus can be inverted at the required depth by transferring the weight of suspension from the first cord to the second. In this instance the liquid enters from the air release valve, while the displaced air issues from the valve with projecting spindle at the opposite end.



Canadian Chemical Plant

Joint British Venture

THE establishment in Quebec Province of a chemical plant sponsored by two important English companies is assured as the result of a sale completed by War Assets Corporation. Durham Chemicals (Canada), Limited, of Montreal, are the purchasers of the plant in question, which is located at Cap de la Madeleine. It was formerly operated as a war industrial establishment by Electric Steels, Limited, and is now being converted for the manufacture of zinc oxide and other chemical products.

When the plant goes into production it is estimated that it will be employing at least 200 male operatives, a figure that may eventually rise to about 500 in the course of two years. It is said that the establishment of this plant in the Three Rivers area will absorb male workers who were previously engaged in war industries, and for whom there had been insufficient employment since the wartime plants had been closed down.

The enterprise is a joint venture of Harrisons & Crosfield, Ltd., London, and the Newcastle-upon-Tyne Zinc Oxide, Ltd., of Birtley, County Durham. The former company has interests in a rubber plantation and tea in Malaya, Java, Sumatra and Borneo, while the latter company manufactures industrial chemicals. Administration and marketing will be in the hands of Harrisons & Crosfield (Canada), Ltd., Montreal.

Rubber Filling

The use of expanded rubber for sandwiching between ply as a method of economising on solid timber has achieved some popularity in many directions in Scotland. This was demonstrated at the "Dundee Made" Exhibition, where samples were shown by the Expanded Rubber Co., Ltd., a subsidiary of BX Plastics. This firm operates one of the newer factories established on the Dundee Industrial Estates, and is concerned with industrial application of expanded ebonite materials. These have non-intercommunicating cellular structure which gives light weight material immensely strong, and capable of application in a very wide variety of directions where timber was formerly used.

Among other uses, it is replacing timber in trawlers where fish holds were formerly constructed in wooden sections. The present tendency is to use a 2 in. core sheet of expanded rubber between light gauge aluminium sheets to produce a material which has the virtue of being bacteria free, easily washed, and perfectly insulated, making it ideal for this purpose.

Official Notice

Turpentine Price Reduction

The Board of Trade announces that as from September 1 last the selling prices of turpentine and pine oil sold by the United Kingdom Naval Stores Association, Ltd., 46 St. Mary Axe, London, E.C.3, have been reduced as follows :—

	New price per ton	Old price per ton
American gum spirits ...	£95	£125
Portuguese gum spirits ...	£85	£115
American steam distilled wood spirits	£85	£110
Pine oil	£85	£115
Net, naked, including duty, ex store United Kingdom, in loan drums		
Pine oil (10 gallon drums) ...	9s. 0d.	11s. 6d.
(5 gallon drums) ...	9s. 6d.	12s. 0d.

Gas and Hard Coke

The Ministry of Fuel and Power announces that consequent upon the increase of 4s. per ton in the pithead price of coal on September 1, 1947, an increase of 6s. per ton in the works prices of gas and hard coke has been authorised as from September 15.

Retail prices of coke will be increased accordingly.

Export Licencing Changes

With effect from Monday last, the Board of Trade has made an Order (S.R. & O. 1947, No. 1945) releasing exporters from the obligation of obtaining licences for gum damar, cod liver oil and some of its preparations, and some forms of rubber. It is now necessary to hold an export licence in respect of aluminium and its alloys in unwrought forms.

Price of Hard Soap

The Ministry of Food announces that because of the increased cost of raw materials, the prices of most varieties of hard soap, including household bar soap and carbolic soap, have been increased by 4½d. per lb. The revised prices are embodied in a new Order, the Soap (Maximum Retail Prices) (Amendment) Order, 1947.

Stearine Price Increase

The Ministry of Food announces that during the eight-week period ending November 8, 1947, the price of Empire stearine will be increased by £1 to £119 per ton c.i.f. in softwood barrels.

Argentine Customs Tariff

Section VI of the new Argentine Customs Tariff is now available for inspection at the Export Promotion Department of the Board of Trade. It relates to paints and varnishes, perfumery, soaps, candles, glues, gelatines, fertilisers and explosives, the new rates of duty being given in Argentine paper pesos. Trade associations, it is understood, are to be allowed 30 days in which to examine the new tariff, though this period may, if necessary, be extended.

NEXT WEEK'S EVENTS

SATURDAY, SEPTEMBER 20

Aslib. London School of Economics, Houghton Street, W.C.2, 11 a.m. Professor Rudolph E. Peierls : "The Effect of Atomic Energy Developments on Scientific and Technical Publication."

THURSDAY, SEPTEMBER 25-27

Society of Dyers and Colourists. Albert Hall, Albert Road, Blackpool. Symposium on "Recent Advances in the Theory and Practice of Dyeing."

FRIDAY, SEPTEMBER 26

Society of Public Analysts and Other Analytical Chemists. University Chemical Laboratories, Cambridge, 2 p.m. Joint meeting of the Micro-Chemistry and the Physical Methods Groups. Cecil L. Wilson : "Micro Methods for Molecular Weight Determination"; J. Tinsley: "Turbidimetric Methods Used in Agricultural Analysis"; J. T. Stock: "Micro-chemical Applications of Potentiometric Methods"; H. P. Rooksby: "Micro-analysis Using X-ray Diffraction Technique."

Indian Tariff Changes

Consequent upon the passing of the recent Indian Finance and Indian Tariff Acts, a number of amendments to the Indian Customs Tariff have become necessary. Among the Protective Tariff additions listed in *The Indian Trade Journal* (August 7, page 260) are the following:

Calcium chloride (British manufacture)—Rs. 3-4 per cwt.; (from other sources)—Rs. 4-14 per cwt.; phosphoric acid—Rs. 23 per cwt.; potassium bichromate, sodium bichromate, and all chrome compounds—30 per cent *ad valorem;* sodium phosphate (British manufacture)—Rs. 7-6 per cwt.; (from other sources)—Rs. 11 per cwt.; sodium sulphite and sodium bisulphite (British)—Rs. 8 per cwt.; (from other sources)—Rs. 12 per cwt.; sodium thiosulphite (British)—Rs. 5 per cwt.; (from other sources)—Rs. 7-8 per cwt.

Linseed Oil Substitute

Attempts undertaken in Scotland to find substitutes for linseed oil have not proved entirely successful. The linoleum industry there—to mention one example—has been experimenting with fish oils, but have found them so unsuitable that it has been decided to discontinue plans on hand and to attempt to revert to linseed or a more suitable substitute.

Some reports state that sardine oil used as a substitute has proved excessively acid and has ruined several cargoes of linoleum sent to tropical climates.

Ten-Year Science Programme

A broad programme for Federal support of scientific research and development in the United States during the next ten years is suggested in a report by the President's Scientific Research Board made public at the end of last month. The report, entitled "Science and Public Policy," is the first of five which will outline comprehensive studies in Federal scientific research, administration, manpower and medical research.

The report, submitted by Dr. John R. Steelman, recommended the establishment of a national science foundation in the executive office of the President. The report said the foundation should be authorised to spend 50,000,000 dollars in support of basic research its first year, with increasing amounts rising to an annual rate of 250,000,000 dollars by 1957.

Dr. Steelman prepared the report after consultation with members of the research board which includes the Secretaries of War, Navy, Interior, Agriculture, Commerce, and members of the Office of Scientific Research and Development, the Atomic Energy Commission and the Tennessee Valley authority.

The report suggested U.S. aid in construction and equipment of scientific laboratories in universities of Europe and Asia, and increased exchanges of students of science, professors and research workers.

Canadian Salt Plant

Construction of a salt plant at an estimated cost of from 750,000 to 1,000,000 dollars is underway at Elk Point, 120 miles east and north of Edmonton, Alberta, and 35 miles north of Vermilion, where Anglo-Canadian, Home Oil Co. and Calgary and Edmonton Corpn. have jointly developed both natural gas and salt. The site is two miles east of the Lindbergh railway station and a few hundred feet from North Saskatchewan River and the Canadian National Railway line to Edmonton. A railway spur to the site, excavations and cement foundations have been completed, and building is now under way. First shipments of machinery and equipment are en route, and it is expected that the plant will be in operation towards the end of the year.

There is said to be an unlimited supply of salt in three beds having a total thickness of more than 1000 feet, starting at depth of about 2600 feet. Fuel gas will be supplied from the Viking sand and lower Cretaceous rock, at shallow depths of from 1000 to 1400 feet. Water, required in large quantities for flushing of salt, will come from the river. Two salt wells and three gas wells adjoin the plant, which is to be operated by a subsidiary.

Colombian Salt Project

With the idea of developing its chemical industry still further, operations at the salt mines of the Banco de la Republica, Colombia, will be extended and a plant erected to produce soda ash, caustic soda, and chlorine. The project is to be undertaken at a cost of 25 million pesos and a contract has been granted to a United States company for erecting the plant and installing the equipment. This plant will be the first in Colombia to produce alkalis, and it is hoped that operations can start in 1949. Under the expanded operations, refined salt production will be increased to 200 metric tons daily. It is planned to provide capacity for the manufacture of 100 tons of soda ash and 25 tons of caustic soda daily (including 5 tons electrolytically produced) and of 12 tons of bicarbonate of soda and 5 tons of chlorine. The caustic soda will be used by the republic's expanding rayon industry in Barranquilla and Medellin and the soap industry centred in Barranquilla. The soda ash will be valuable to the glass and paper industries. A chlorine plant near Bogota, the Compania Colombiana de Cloro y Sos Derivados, operated jointly by the Instituto de Fomento and the City of Bogota, produces 5 tons of chlorine daily, all of which is needed by existing water-purification systems. The new plant will be equipped to supply chlorine to the textile industry and will permit the development of additional water systems.

U.S. Fears

How some American chemical interests view the possible effects of the rehabilitation of the German chemical industry is reflected in a recent expression of opinion by the New York *Drug and Cosmetic Industry.* It should be borne in mind, says this journal, that during the war—whether by the grace of God or by reason of deliberate policy—many of the pharmaceutical and fine chemicals plants of the German cartel were not destroyed by bombs—as a matter of fact, many were not even touched . . . we now have the spectacle of America and Great Britain working to rehabilitate the German chemical trust with its tentacles reaching out into every country of the world.

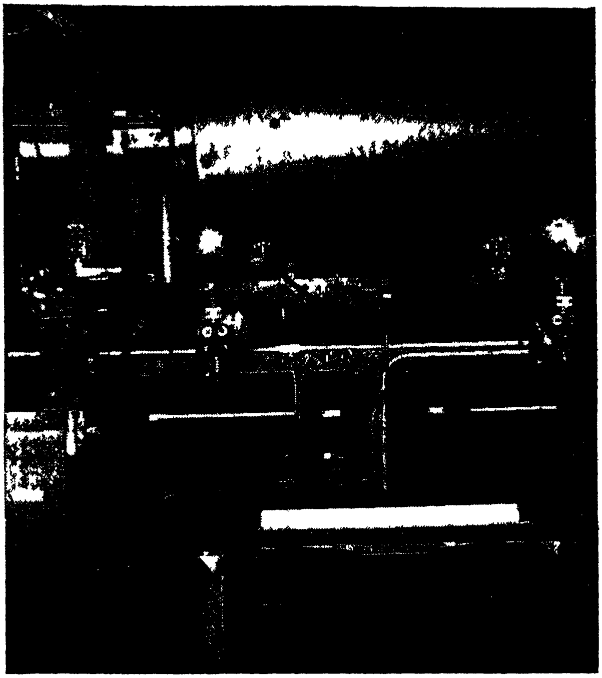
This is a great challenge to American exporters of drugs and chemicals. If we are to judge by pre-war experience, their export prices will be low; if not now, then soon. What we don't know is whether the high level of German efficiency and relatively low wage-scale will prevail in the future. This competition is serious, particularly in our field, because German products in our line were well and favourably known under German trade-mark names throughout the world.

Automatic Tank Welding

BY the use of automatic arc welding equipment and an ingenious welding fixture, one petrol storage tank 36 in. in dia. and 68 in. long is being turned out every two minutes at the Dayton Pump and Manufacturing Company, Dayton, Ohio. Two General Electric WFB welding heads are mounted so that both ends of a tank can be welded at once. The welding heads feed bare or lightly-coated electrodes, and maintain a constant arc voltage by the use of thyratron control panels. Two operator's stations are provided, one on each side of the fixture. These are interconnected so that operation can be controlled from one or both stations.

After the casing and headers are loaded into the fixture, a hydraulic ram passes the headers on to the casing to provide a tight lap joint. The tank is automatically centred in the fixture and the entire mechanism is rotated.

A push-button starts travel and welding at the same time. An air cylinder at the top of the fixture raises and lowers both welding heads at once. A limit switch is adjusted to stop operations after the weld is completed. Ground connections are made through two riding rolls which contact the casing a short distance from the arcs. This feature reduces interference from magnetic arc blow. Longitudinal seams are welded on another fixture, also using a WFB welding head.



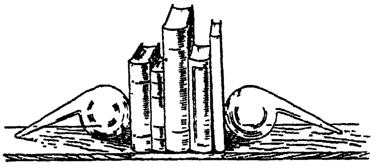
Ingenious automatic welding method to speed production of tanks.

Burma Oil Industry Development

In the course of his address at the 45th annual general meeting of the Burmah Oil Co., Ltd., last week, Mr. Robert I. Watson, chairman and managing director, said that the company had been holding conversations with other oil interests in Burma with a view to bringing about a unification of operations.

Chemical Prices

That there are rising production costs in the chemical industry is evidenced by two price increases announced from September 3 by Monsanto Chemicals, Ltd., this week. Phenacetin is now priced at six shillings a pound dropping to five for large quantities, and phenolphthalein now ranges from 5s. 9d. to 6s. 9d. according to quantity.



A CHEMIST'S BOOKSHELF

The New Fibres, Joseph V. Sherman and Signe L. Sherman, Brooklyn. Nostrand Publishing Co., Ltd. (Macmillan and Co., London), 1947, pp. 537. 28s.

We have witnessed the astonishingly rapid developments of man-made fibres and these deserve the interest not only of the textile industry, but also of the chemical and chemical engineering industries, for the manufacture of man-made fibres involves new plant and large quantities of heavy and fine chemicals. Fibres are a commodity of the first order, and since the world urgently requires textiles of all kinds, man-made fibres will be in demand to a degree which is not yet fully recognised even in the circles most concerned. Of immense interest to consumers, who have been used to having textiles made from natural fibres, is the question of whether there is a real outlet for man-made fibres if natural production can be substantially increased. Experience shows that the production of natural fibres cannot fill the gap, particularly as its location is governed by climatic and labour conditions, etc. On the other hand, raw material for man-made fibres is available almost everywhere.

Until comparatively recently, it was considered doubtful whether man-made fibres could compete with the natural variety owing to the high demands of quality and endurance. But wonderful technical developments have proved that for a very large variety of purposes the artificial fibres now available can satisfy nearly all the demands which can reasonably be expected, and this applies particularly to mass-produced textiles which are of major importance.

New developments occur almost daily, and it seems to be of greatest importance that the prices of man-made fibres are already successfully competing with natural fibres, for instance, cotton, and have even fallen below cotton prices. But it is the chemical aspect of the matter which is most deserving of praise. This has attracted the best technicians and scientists and they have been well recompensed, thanks to the foresight of manufacturers who spent large and increasing sums on research. Elsewhere, the writer intends to discuss the significance of these developments insofar as they affect the textile industry, but the present and future importance which the manufacture of artificial fibres has for chemical industry, points to the need for all scientists, technicians, commercial men and users of textiles to receive information. There was thus an obvious need for a book that would attempt to serve all interests by giving information on the scientific and the economic aspects of the industry. The book by Mr. and Mrs. Sherman, the former an economist, the latter a chemist and technician, fulfils the demand in a praiseworthy manner. According to my knowledge, it is the first book of its kind, and all who read it can be expected to derive great benefit. There will, of course, be some individuals who will not be fully satisfied with its contents owing to the absence of certain matters in which they are particularly interested. But he would be a clever and fortunate author who could obtain universal approbation.

Critics have said that this book, which contains an excellent survey of existing literature, confines itself mainly to American developments. However, in view of the difficulties of recent years, it is only to be expected that the book would lack much of the information from sources outside the United States, for it is only now that information is becoming available. The book has given a small taste of the enormous developments in Germany, Italy and other European countries which were under the influence of Germany during the war. Reference is also made to Japan, which even before the war had become one of the largest manufacturers of man-made fibres. Russia has no doubt also made progress.

The authors, who deserve the confidence of all concerned, might do worse than consider the preparation of a new edition, perhaps in collaboration with other authors, and to include in it more of the experience which will be available from other parts of the world. This well-produced book may well prove to be a best seller, and, therefore, the time may be near when this next edition is available to the public.

G. ULLMANN

Stearine Price Increase

The Ministry of Food announces that during the eight-week period ending November 8, 1947, the price of Empire stearine will be increased by £1 to £119 per ton c.i.f. in softwood barrels.

Home News Items

Change of Name.—Bowmans (Warrington) Ltd., of Mossbank Works, Widnes, has been renamed Bowmans Chemicals Ltd.

Cement Price Up.—The Ministry of Works has announced an increase of 3s. 6d. per ton in the price of cement, with effect from Monday last. The London price is, therefore, 59s. 6d., plus 10s. for bags.

Iron and Steel Development.—Plans to increase the steel ingot capacity of Skinningrove iron and steel works at Saltburn by about 40 per cent to 300,000 tons a year are to be carried out at an estimated cost of £1,700,000.

Lecture Courses.—Commencing at the Northampton Polytechnic, E.C.1, on October 7 and 8 respectively, will be two courses of lectures, namely: (1) Fuel Economy in Relation to Steam Generation and Steam Utilisation, and (2) Refractories, Their Production, Properties and Uses.

Coal to Oil.—Conversion from coal to oil burning on the railways and in industry has made "substantial progress," claims the Ministry of Fuel. The estimated saving of coal by the middle of 1945 is 8 million tons annually, employing 5 million tons of oil. At the end of March oil consumption was at the annual rate of a million tons.

Alarming Coal Situation.—Many firms in the dyeing and finishing section of the textile industry have had to call on their coal stocks owing to the Yorkshire dispute; this has led to a position described as "very alarming." According to a member of the Allied Association of Bleachers, Dyers and Finishers, some firms will have to close down unless stocks are quickly replenished. Worst hit is the East Lancashire cotton belt, which is normally dependent on South Yorkshire for about 80 per cent of its supplies.

Atomic Scientists' Conference.—Specific aspects of atomic energy development and wider prospects will be reviewed at Oxford today (Saturday) when the Atomic Scientists' Association are the organisers of a conference at the Clarendon Library at which the principal speakers will be Dr. H. W. B. Skinner, who will discuss the work of the Atomic Energy Research Association, Harwell, of which he is deputy director, and Sir Charles Darwin, director of the National Physical Laboratory, who will talk on "Atomic Energy and the Veto."

Business Efficiency Exhibition. — The Business Efficiency exhibition is being held this year from October 1 to October 11 at Olympia.

Address Transferred.—As from Monday next, September 22, the registration department of British Oxygen Co., Ltd., will be 24 Grafton Street, W.1, (Tel. No. REGent 4406-7).

Steel Output Rises.—Steel output in August rose to the annual rate of 12,178,000 tons, compared with 11,007,000 a year in July and 11,747,000 in August, 1946. Pig-iron production was at the rate of 7,660,000 tons a year, against 7,460,000 tons in July and 7,558,000 tons in August last year.

Coal Production Increase.—North-West coal production was stepped up by 6100 tons, the 59,000 miners in the area hewing 267,800 tons for the week ending September 6, compared with 261,700 in the last week of August and 243,400 tons in the first week of September last year.

Pocket Thermometer.—An interesting exhibit at the British Rototherm Company's stand at the Engineering and Marine Exhibition, Olympia, was a pocket thermometer enclosed in a stainless material sheath and fitted with a pocket clip. Temperatures are read from a 24 mm. dia. dial, and the entire instrument has an overall length of less than 5 inches.

Harrison Memorial Prize.—The Harrison Memorial Prize, not to exceed a maximum of £150, is to be awarded in December of this year by a special selection committee comprising the presidents of the Chemical Society, the Royal Institute of Chemistry and the Pharmaceutical Society. The prize which is open to either sex, will be awarded to a British subject of not less than 30 years of age, for original research published during the past five years.

Low-Temperature Refrigerator.—Believed to be the only plant of its type available in this country, an automatic low-temperature cabinet capable of being operated at a temperature of −95° C. has been produced for research purposes by a Kentish engineering firm. Produced almost exclusively from standard equipment, refrigeration is accomplished by two small refrigerating compressors arranged to run in cascade. The cooled cabinet is a cylindrical metal vessel 19½ in. internal diameter by 36 in. high.

Personal

Mr. Joseph Godber, late director of Thorncliffe Coal Distillation, Ltd., and of National Benzole Co., Ltd., who died in May last, left £45,193—net personalty £43,401.

Professor F. G. Donnan will give the Ernst Julius Cohen Memorial Lecture of the Chemical Society in the rooms of the Chemical Society, Burlington House, W.1, on October 2.

Mr. Harold S. Milne, Aberdeen Corporation gas manager, was elected president of the North British Association of Gas Managers at its 86 annual general meeting last week.

Mr. R. J. Morton, a director of Lyall Willis & Co., Ltd., is to visit South Africa, Rhodesia, Australia, New Zealand, India and Ceylon with a view to appointing agents in those countries. He will be leaving this country towards the end of the year.

Mr. Leslie F. Wright, chairman and managing director of Gjers Mills & Co., Ltd., Ayresome Iron Works, Middlesbrough, and a member of the British Iron and Steel Federation, is to contest the Middlesbrough West parliamentary division as a Conservative at the next general election.

Dr. Cyril Tyler, who has been lecturer in agricultural chemistry at the University of Reading for more than 20 years, is to succeed Prof. H. A. D. Neville in the chair of agricultural chemistry at the same university. The change is to take place at the end of this month.

Sir Robert Howell Hutchings and Mr. H. W. Palmer have been appointed directors of Glaxo Laboratories. Miss I. Townsend—who has been with the company since 1919, and who has been mainly concerned with export business—has been appointed an executive director.

Sir Henry Tizard, chairman of the British Defence Research Advisory Committee is in Canada for discussions with the Canadian Defence Research Board. He is to be joined by Sir Ben Lockspeiser (chief scientist, Ministry of Supply), Dr. O. H. Wansbrough-Jones (scientific adviser, War Office), and Dr. C. A. Carroll (Admiralty).

Mr. W. R. Eadie, formerly assistant secretary of the Manchester Regional Office of the Federation of British Industries, has been appointed secretary of the South-Western Region of the F.B.I. at Bristol. Mr. Eadie, who was educated at the King Edward VI School, Southampton, is 37 years of age. He served an apprenticeship to the motor industry, and later obtained experience in factory lay-out, material and production control, buying, sales, and export and commercial management.

Mr. Keith McLaren, of the Leather Section of I.C.I. (Dyestuffs Division) has been awarded the 1947 Donald Burton Prize for his paper "Investigations into the Degreasing of Sheepskins," which he read recently before a meeting of the British Section of the International Society of Leather Trades' Chemists. Mr. McLaren, who is 27, graduated from Leeds University in 1943.

Sir John Macfarlane Kennedy has been appointed chairman of the Electricity Commissioners in succession to Sir Cyril W. Hurcomb, who has resigned his appointment to take up office as chairman of the British Transport Commission. Sir John was appointed an Electricity Commissioner in 1934, and deputy-chairman of the Commissioners in 1938.

Mr. John Ireland and Dr. E. S. Hedges, director and director of recearch respectively of the Tin Research Institute, left for the U.S.A. on Wednesday last. After visiting the Bettelle Memorial Institute, Colombus, Ohio, where information on results of research will be exchanged, Mr. Ireland and Dr. Hedges will visit other research centres before returning to this country on November 26.

Mr. James S. Risk has been appointed head of the recently established Department of Industrial Administration, Royal Technical College, Glasgow. Mr. Risk attended Glasgow Academy before going to Glasgow and Edinburgh Universities. He qualified as a chartered accounted in Glasgow in 1939, and during the war was engaged in work at various ordnance factories in England, and with the British Corporation in Persia and Egypt. From 1945 he was employed on investigations by a firm of industrial consultants in London.

Scottish Office of D.S.I.R.

The Department of Scientific and Industrial Research has opened a Scottish Office at 18 Melville Street, Edinburgh, to facilitate close contact with Scotland. The office will have a dual function—to encourage the prosecution of research by industry itself and to increase the effectiveness of the contribution which existing Government research establishments make to Scottish industry.

The new office will co-operate with the Departments of the Secretary of State for Scotland, with the organisations in Scotland of other Government departments, and with voluntary bodies such as the Scottish Council (Development and Industry). It will also study the Scottish industrial position with a view to assisting in the formulation of problems suitable for research. The office will apply existing research facilities as effectively as possible to Scottish needs.

Overseas News Items

Oil Discovery in Japan.—The largest oil-field in Japan is reported to have been discovered near Teshio; it is said to be 50 miles wide and to extend under the sea.

Calcium Carbide Import Duty.—A recent Mexican Government decree imposes an import duty of 0.25 pesos per kilo (gross) of calcium carbide. The duty was formerly 0.15 per kilo.

Superphosphate Production in U.S. Zone.—The Albert Chemical Works at Wiesbaden-Bieberich recently began the manufacture of superphosphate. Steps are already being taken to increase output.

Artificial Fog.—Swedish scientists are to experiment with artificial fog, the object being to lessen the effect of the autumn frosts which frequently kill large numbers of potato plants.

Rumanian Oil To U.S.S.R.—Exports of oil from Rumania to the U.S.S.R. dropped from 3,070,000 tons in 1945 to 2,170,000 tons in 1946, while domestic consumption rose from 1,400,000 tons to 1,600,000 tons during the same period.

Broken Hill Tin Output.—August output of Rhodesia Broken Hill was 1830 tons of zinc, and 1400 tons of lead. Production of fused vanadium was nil. The July figures for zinc and lead were 1805 tons and 1340 tons respectively.

Austrian Journal Reappears. — The Austrian Academy of Sciences announces the reappearance of the "Monatshefte für Chemie," published by Julius Springer, Vienna. The journal, which was suspended during the annexation of Austria by the Nazis, enters its 76th volume and the new number, May 1947, has 232 pages and 61 illustrations.

Austrian Nitrogen Output.—The nitrogen works at Linz, Austria, have at present a monthly output of 2500 tons, equal to about one-half of total capacity. The number of workers increased from 600 at the end of 1946, to the present level of 2200. Negotiations are said to be proceeding with Germany regarding the supply of nitrogen in exchange for coal.

Ruhr Coal Agreement.—The Ruhr coal mines in the British zone of Germany are to be placed under joint Anglo-American control. Responsibility for production will be transferred to a German Coal Management, answerable to an Anglo-American Control Group. Ownership of the mines will not be affected and the output target is 300,000 tons daily and 400,000 tons by the end of the year.

40-Hour Week for Australia.—The Arbitration Court of Australia has decided to establish a standard 40-hour week as from January 1 next. Australian price-levels are estimated to rise between 4 and 5 per cent.

German Insulin Production.—Insulin production in Germany, which in the first quarter of this year amounted to 10 million units, is reported to have risen to 13 million units in April alone.

Silver in Australia.—Silver, lead and zinc deposits have been discovered in the New England Ranges, New South Wales. The potential riches of the deposits are said to exceed those of Broken Hill.

Brazilian Exhibition.—An International Exhibition of Industry and Commerce, sponsored by the Federacao Nacional do Comercio, will be held at Petropolis, Brazil, towards the end of 1947.

Industrial Property Rights.—The agreement for the preservation or restoration of industrial property rights affected by the second world war, and signed at Neuchatel on February 8, 1947, has been ratified by Denmark, France and Norway.

Australian Tin Prices Up.—The Australian Prices Commissioner has raised the price from smelters from £A.418 to £A.515 per ton, and per unit to producers from 76s. to 92s. The increase is said to be due to higher production costs and to encourage local production to meet the shortage.

Soil Mechanics Conference. — The Second International Conference on Soil Mechanics and Foundation Engineering is to be held in Rotterdam from June 21-30, 1948. The organisers are the Royal Netherlands Government and the Municipality of Rotterdam.

Canadian Export Boom. — Aluminium, copper and some other base metals represented a substantial proportion of Canada's exports in May, valued at $267.8 million, the highest value recorded since the last month of war and $76.9 million more than in April. The $90.5 million export to the U.K. was more than double the figure for the preceding month.

German Edible Fat and Oil Production.—The Union of German Oil Manufacturers (Verein Deutscher Oelfabriken), owners of the largest plant in the U.S. Zone for the production of cooking fats and oils, has made plans to restore its former capacity. The extraction plant is being rebuilt and will be in operation in the autumn, if the required quantities of oilseed can be imported in time.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

ALUMINIUM & ALLOYS, LTD., London, W. (M., 20/9/47). July 25, £2000 debentures; general charge.

LEEDS ALLOYS, LTD. (M., 20/9/47.) August 8, charge, to Halifax Building Society securing £2000 and further advances; charged on 48 Bowman Lane, Leeds.

INGOT METAL CO., LTD., London, W.C. (M., 20/9/47.) August 13, mortgage, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on 30, 47 and 49 Hitchin Street and 46 Drove Road, Biggleswade. *Nil. December 31, 1946.

STEEL COMPANY OF WALES, LTD., Port Talbot. (M., 20/9/47.) August 5, trust deed dated July 28, 1947, securing £15,000,000 first debenture stock with a premium of 1 per cent; charged on agreement for purchase of properties, and all the right title and interest of the company under such agreement dated July 10, 1947, and general charge; also August 5, trust deed dated July 31, 1947, securing convertible debenture stock limited to £35,000,000, present issue nil; charged on agreement for purchase of undertakings and properties, and other assets dated July 10, 1947, and all right title and interests of the company under such agreement and general charge (subject to etc.)

Company News

The nominal capital of **Rentokil, Ltd.**, manufacturers of disinfectants, insecticides, etc., School Lane, Fetcham, Leatherhead, has been increased beyond the registered capital of £1000, by £4000 in £1 ordinary shares.

The nominal capital of **Ian N. Merrill & Co., Ltd.**, chemical engineers, etc., 19 Cavendish Road, Sheffield, has been increased beyond the registered capital of £1000, by £9000, in 6000 ordinary and 3000 5 per cent cumulative participating preference shares of £1.

The nominal capital of **Farinol Company Ltd.**, manufacturing chemists, manufacturers of cleaning compounds, etc., Manchester, has been increased beyond the registered capital of £7000 by £13000, in £1 unclassified shares.

New Companies Registered

Sterling Chemical Dyes & Colours, Ltd. (441,710).—Private company. Capital £1000 in £1 shares. Subscribers: Sylvia E. Vrana, and Vladislav Vrana. Sylvia E. Vrana is the first director. Registered office: 12 Ebbsleet Road, Cricklewood.

Wycombe Plastics Ltd. (441,846).—Private company. Capital £100 in 100 shares of £1 each. Manufacturers of and dealers in organic and inorganic chemical substances and products, plastics and plastic substances, etc. Subscribers: E. H. Nixon, 197 Grove Lane, S.E.3, and C. H. Ostermoney. Secretary, N. H. Abrey.

Silta, Ltd. (441,217).—Private company. Capital £100 in 100 ordinary shares of £1 each. General merchants, import and export merchants, commission agents and brokers, manufacturers of and dealers in ores, metals, alloys, chemicals, etc. Subscribers: E. S. Beckett, and C. J. Greenaway. Solicitors: Crawley and De Reya, 1 Hanover Square, W.1.

Compressed Products, Ltd. (441,407).—Private company. Capital £1000 in 900 shares of £1 and 2000 shares of 1s. each. Research workers, consultants and advisers, laboratory and workshop proprietors, manufacturing, dispensing and analytical chemists, etc. Subscribers: E. C. Thorne and J. C. Clark. Secretary: E. C. Thorne. Registered office: Swinley Building, Bath Road, Cippenham, Slough.

F. H. Steele & Co., Ltd. (12,035).—Public company. Capital £60,000 in 35,000 participating preference (5 per cent cumulative) and 25,000 ordinary shares of £1 each. Manufacturers, wholesale chemists and druggists, drysalters, etc. Directors: W. M. Birmingham, M.P.S., Dr. Thomas R. Tierney, A. D. Davidson, Sean Brady, Dr. Charles H. McMahon, D. M. McGracken, and F. H. Steele, 3 Lower Hatch Street, Dublin.

Chemical and Allied Stocks and Shares

APART from a general rally in shares of companies which should derive fullest benefit from the higher export targets, stock markets have been quiet and uncertain. News of the sale of gold to America maintained a downward trend in British Funds, while fears of a Budget in the autumn tended to make for a waiting attitude. Selling was light, although with business at a small level it had a disproportionate influence on prices, particularly in the stores and building groups. In fact, shares of companies mainly identified with the home market were out of favour owing to the implications of the Cripps' Plan and fears of more austerities to come.

Textiles were the chief beneficiaries from the Cripps' Export Plan, but the latter also drew attention to chemical shares with Imperial Chemical improving to 44s. 9d. Monsanto Chemicals were 55s. and, following news of the acquisition terms offered to Bengers, Ltd., Fisons have been active with dealings ranging from 62s. 6d. to close on 65s. B. Laporte were 77s. 6d., with W. J. Bush 90s., Greeff-Chemicals 5s. ordinary 15s. 3d. and, elsewhere, British Alkaloids 1s. shares changed hands around 13s 6d. British Glues & Chemicals 4s. ordinary were dealt in around 19s. Glaxo Laboratories 10s. shares showed increased activity, but the price came back to £16½. Lever & Unilever were better at 50s. and United Molasses steady at 45s. 6d., with the units of the Distillers Co. firmer at 128s. 9d. awaiting the consolidated accounts. Shares of companies with important U.S. interests and trading connections were more in favour, Borax Consolidated improving to 53s. 9d. Turner & Newall rallied slightly to 71s. 33d. and Wall Paper Manufacturers deferred were 43s. 9d., General Refractories 20s. and British Aluminium rallied to 43s. 1½d. British Oxygen showed firmness at 90s. Aveling-Barford at 18s. 6d. Ruston & Hornsby at 60s. and R. A. Lister at 97s. 6d. were good on the export plans for agricultural machinery, while Mather & Platt, Howard & Bullough and other shares were responsive to the textile machinery export plans.

The big export target for rubber products was reflected by sharp gains in Avon India Rubber and North British Rubber, this section being led by Dunlop Rubber which gained 1s. 3d. to 64s. 9d. Paint shares became steadier, International Paint being £6¾, Goodlass Wall 34s. 9d. and Pinchin Johnson 54s.

Prominent in the rise in textiles, J. & P. Coates were 64s. 6d., with Calico Printers better at 20s. 1½d., Bradford Dyers 21s. and Bleachers 10s. 7½d. Rayon shares showed only moderate movements. Courtaulds being 45s. and British Celanese 25s., higher export targets having been already discounted by recent improvement in share prices.

Iron and steels remained firm under the influence of the good output figures. Stewarts & Lloyds were 47s. 9d., United Steel 24s., Dorman Long 24s. 3d., Guest Keen 44s., Colvilles 24s. 6d. and Allied Ironfounders 51s. Babcock & Wilcox at 66s. 9d. lost a small part of an earlier rise, but Tube Investments rose further to £6.

Boots Drug showed steadiness at 54s. 6d., Beechams deferred eased to 22s. 3d., Griffiths Hughes were 53s. 9d. and Timothy Whites 40s. 6d. British Drug 5s. ordinary have been active around 12s, buyers being attracted by the company's big export trade interests. Oil shares lost ground with Anglo-Iranian falling to £8 following reports of latest Russian political moves in Persia. Exceptionally, however, Trinidad Leaseholds rose 2s. 6d. to 97s. 6d.

British Chemical Prices

Market Reports

A STRONG demand persists in almost all sections of the industrial chemicals market and, even allowing for the possibility of some curtailment of demand due to fuel difficulties, there appears to be little immediate prospects that supplies will catch up with the full requirements of the home industrial consumers. The necessity for maintaining and where possible increasing the export trade is another factor which points to the continuation of the present firm condition. Supplies of the whole range of potash compounds remain tight, and in the soda products the routine items such as the alkalis and bichromates are difficult to secure for nearby delivery. There has been no change in the coal-tar products market, although pitch has been moving well on export account.

MANCHESTER.—Quotations on the Manchester chemical market during the past week have been steady to firm in virtually all sections and, with increasing fuel and transport costs, an early upward movement in many directions is becoming more and more regarded as a probability of the near future. Contracts are being steadily drawn against in the alkalis and other leading heavy products and replacement buying by industrial consumers has been reported. Shipping inquiry during the past few days has been on a fair scale. Trade in fertilisers tends to expand steadily. In the tar products section a brisk demand for most lines continues to be reported.

GLASGOW.—There has been no change in the Scottish chemical market this past week, although there is still a continued demand for zinc oxide and a number of firms in the paint trade have to contend with the off-colour grades.

In the export market inquiries continue on a large scale and a number of orders have been booked for materials such as potassium nitrate, all grades of zinc oxide and limestone. It has been noted, however, that import licences have been difficult to procure in China for various materials.

HYDROGEN PEROXIDE (*Contd. from p.* 397)

from the gears. There is a diesel engine for surface and schnorkel operation; a main motor and a creeping motor for submerged battery drive. The main motor also serves as a generator while the boat is being driven by diesel engine or Walter engine. The creeping motor is a high-speed, low-power affair which drives the main shaft through multiple V-belts. The main turbine drives through a conventional single-reduction double-helical gear and then through a planetary gear. The diesel and main motor are on the same shaft and drive only through the planetary gear. The single-reduction gear and turbine can be disconnected by a clutch. The main motor and diesel or just the diesel are connected or disconnected by clutches. The main motor, however, always operates, either as a motor or as a generator, except when the creeping motor is in use. All gears are disconnected when using the creeping motor.

Submarine Propulsion

Submarine propulsion was the ideal application for H_2O_2, its value resulting from the fact that using H_2O_2 is a good way to obtain O_2 for combustion when operating submerged. It was carried in collapsible polyvinyl chloride bags outside the pressure hull. The hydrostatic pressure outside kept a positive pressure on the Ingolin pump. Ingolin used from inside the bags was displaced by sea water outside the bags, which compensated for about three-quarters of the weight of Ingolin used, the difference being the difference in the specific gravity of the two liquids. Fresh water obtained by condensing the H_2O in the turbine working fluid could compensate for the difference, in order to maintain neutral buoyancy. Actually it was not done that way, but was accomplished by admitting sea water into a compensating tank. Excess fresh water was forced overboard with the CO_2 and other gases.

The chief disadvantage of the use of Ingolin is its high cost. In operation, about nine times more of it is used than diesel fuel, and it costs 60 to 80 times as much per pound. If one multiplies 60 or 80 by 9, the high cost is quickly seen. As a matter of fact, its cost is near enough to a thousand times greater than fuel oil and that figure can be used as a rough comparison of costs when using H_2O_2 and oil for producing power.

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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Explosives.—E.I. Du Pont de Nemours & Co. Aug. 12, 1943. 19498/1945.

Process and apparatus for monitoring synchronising generators.—A. B. Du Mont Laboratories, Inc. Feb. 13, 1945. 15653/1946.

Coated methyl methacrylate polymer.—E.I. Du Pont de Nemours & Co. Feb 16, 1946. 4523/1947.

Explosive compositions containing a water-soluble inorganic salt.—E.I. Du Pont de Nemours & Co. Nov. 13, 1940. 20060-65/1947.

Explosive compositions containing a water-soluble inorganic salt.—E.I. Du Pont de Nemours & Co. Aug. 3, 1939. 20066-67/1947.

Heat treatment of cold-worked austenitic chromium alloy steels.—Electro Metallurgical Co. Dec. 22, 1938. 19849-50/1947.

Method of producing a catalyst useful for the catalytic cracking of petroleum, the improved catalyst resulting therefrom, and the cracking hydrocarbons employing the improved catalyst. — Filtrol Corporation. Sept. 7, 1942. 24285/1946.

Beta hydroxy carboxylic acid lactones and process of preparing same.—B. F. Goodrich Co. May 15, 1941. 18853/1947.

Plasticised vinyl halide compositions.—B. F. Goodrich Co. March 9, 1940. 19103/1947.

Plasticised vinyl halide compositions.—B. F. Goodrich Co. Feb. 20, 1941. 19104/1947.

Plasticised vinyl halide compositions.—B. F. Goodrich Co. May 25, 1940. 19105/1947.

Alpha-beta unsaturated monocarboxylic acids and method of producing same.—B. F. Goodrich Co. July 31, 1941. 19106/1947.

Stabilised vinyl halide compositions.—B. F. Goodrich Co. March 1, 1941. 19107/1947.

Beta-alkoxy monocarboxylic acids and method of preparing same.—B. F. Goodrich Co. Aug. 5, 1941. 19456/1947.

Method of coagulating dispersions.—B. F. Goodrich Co. Nov. 29, 1940. 20051/1947.

Process of forming a highly reactive carbon, and the highly reactive carbon resulting from said process.—Great Lakes Carbon Corporation. July 24, 1944. 19455/1947.

Accelerators for the vulcanisation of rubber.—M. W. Harman and Monsanto Chemical Co. Dec. 6, 1944. 2578/1946.

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Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (16 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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European Recovery

THE plan for European recovery drawn up by 16 nations concerns the peoples of Europe, including ourselves, intimately. It was obvious to everyone that the destructiveness of this war had greatly exceeded that of any previous war, and that the problems of reconstruction would be proportionately great. Many people thought that once the fighting had ceased, everyone would turn back to work with a will and clear up the mess. That hope proved illusory. There are still vast heaps of rubble where once there were German towns. The Germans, brought up to obey orders, still tend to leave the rubbish where it is until someone tells them to move it. The destruction of property, of plant and machinery cannot easily be made good, and to get the task started is in itself a difficult undertaking. Labour must be made available; skilled labour must be sought with diligence if it is to be found at all. Materials are unobtainable. The division of Germany into zones internationally controlled, with a semi-permeable membrane between certain zones through which the more solid goods do not pass, adds to the difficulty. Europe's prosperity was in large measure dependent on German industry, and the vacuum now existing in Central Europe is proving hard to fill.

Every European nation, victors no less than vanquished, has been impoverished through the war. The agricultural production of every nation has been disrupted. Food is short and Eastern European producers on whom so many depended for their grain have none to spare. Famine stares Europe in the face. The manufacturing plants of other parts of Europe besides Germany are out of gear. Export trade is very much less than before the war, and many have not the money to spend on goods. Other nations besides Britain have lost their invisible exports and their overseas investments. Many nations are in much the same plight as Britain, and in some their plight is worse and more pressing. To all these the Marshall Plan came as a gleam of hope and as such it has been made the signal for action.

The difficulty of the period of bad trade that followed the war of 1914-18 was that there was production without markets. Industrial plant had not been destroyed to any extent, but on the contrary additional plant had been built for war purposes that was converted to peaceful manufactures. Foreign agriculturists had increased their sown acreage for every kind of edible produce. The world was full of goods and of provisions, but people were too poor to buy them. Had there been some means of permitting people to buy more goods than their real wages entitled them to, an age of plenty might well have resulted in which there would have been no excuse for war. We did not solve that problem. Factories closed. Producers of foodstuffs burned their produce in despair. Not until war production again enabled a high rate of manufacture to be secured did unemployment and malnutrition fall to reasonable levels. That was a crisis of under-consumption.

The crisis to-day is deemed to be the opposite: a crisis of under-production. Consequently, the 16 nations that have accepted the Marshall Plan have declared that each will put its internal economy on a sound basis and that everything possible

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will be done to bring productive capacity back to, or above, 1938 levels. Agriculture is to be brought back to that level. Coal production is to be increased, though it cannot touch the pre-war figures—not all at once. The output of electricity is to be raised by 40 per cent above 1947 level by 1951. Home refining of oil—a policy frequently urged in this paper during the past few years—is to be raised throughout Europe to at least 2½ times that ruling before the war. The output of steel is to be increased to 80 per cent above 1947 and 20 per cent above 1938. These measures will suffice to bring European production broadly back to pre-war standards though not entirely so. The standard of living will still be less than in 1938. The increased steel output is necessary to restore war damage and to provide for new machinery. There is nothing in the programme that creates the feeling that the 16 nations are being too ambitious. It is true that the final implementation of the plan depends on a free flow of trade with adequate export markets. It is possible that after 1951 we shall find ourselves facing the problem that defeated us in 1930; but with goodwill all round throughout the world, that problem should prove less intractable than it did 20 years ago.

It is very cheering to observe through this report the spirit of comradeship among the nations of Europe. For example, a series of projects is being planned for the exploitation of new sources of electric power, including hydro-electric resources of the Alps, German lignite and Italian geo-thermal energy; this involves co-operative development of resources cutting across frontiers, and decisions are being taken without regard to these frontiers. International standardisation of mining and electrical equipment and of freight cars is another example of the merging of the national in the international. Yet another is the interchange of information between nations on the development of their steel industries. These developments suggest a first tangible approach to Mr. Churchill's conception of a United States of Europe. It is particularly apposite that this should come about through the international development of scientific and technical resources.

American help will be needed to get this programme into practical operation. The needs of Europe are greater than can be met through the internal resources of the Continent at present. Import needs are greater than normal, investment earnings are reduced, industries have been handicapped by nationalisation, exports are insufficient to meet the cost of imports. In Britain there will be much to be done to help Europe—and ourselves. This crisis should leave no one in doubt that among nations, as among the concerns forming part of any specific industry, the prosperity of each one is important to the balance of the whole. Under modern conditions we cannot be prosperous unless our customers and competitors are also prosperous. In economics, our unit must be the world and not the nation, the firm or the individual—as it too often has been in the past. Britain, therefore, is pledging much of her own production directly to help Europe's reconstruction. It is our part to increase our exports of coal to Europe, to increase our steel output, to increase and rebuild our merchant fleet, to increase the capacity of our electrical generating stations, and of our agriculture. Very large increases over the whole range of industry and agriculture are to be our part in the reconstruction of other countries. If these problems are tackled boldly, with vision and enterprise, and with the help of American finance, the future is bright; but hard work is essential to success. What is now needed is a leader to arouse our people to the realisation of the part they must play in the rebuilding of the world.

NOTES AND COMMENTS

A Bad Start

THE first " progress report " since the desperate need of greatly increased exports was given official prominence by Sir Stafford Cripps can give rise to no optimism. Total value of U.K. exports in August was £93.6 million—£16 million less than the July figure. That is a bad start, even if we disregard the facts that the further efforts now required had not been made known when the transactions on which these figures are based were being made and that the July returns represented an abnormally high level of trading. The immediate export target, we are told, is about £126 million monthly, leaving a gap between last month's results of more than £32 million. Whatever lessons are to be learned from the latest unpromising survey by the Board of Trade, one thing at least is manifest to all—not excluding, one hopes, Sir Stafford Cripps: no very substantial improvement will be possible unless fully adequate supplies of fuel and power are provided. It is undoubtedly because of this deficiency, heightened by difficulties of the raw materials market, that chemical production, reflected in the Board of Trade survey, sagged in August to £3,073,601 from the £3,398,005 of the previous month and that the result for the first eight months of the year was only £23,591,969 compared with more than £27 million a year before. Almost every branch of heavy chemical production has shown the same falling off and there have been very conspicuous reductions of chemicals most dependent upon fuel supplies, notably of soda ash and other sodium compounds, of which we sold £950,744 worth in the past eight months, some £728,000 less than in the same period of 1946.

Industrial Genesis

AMONG the discoveries from which great chemical industries have sprung few, if any, are more arresting in their " Jack and the Beanstalk " quality than Alfred Nobel's revelation in the '60's of last century that death-dealing nitroglycerine, when absorbed in the filter substance kieselguhr, was a relatively safe and by far the most potent commercial blasting agent then known. That discovery was, of course, the germ of the vast I.C.I. Explosives Division, successor to Nobel Industries, Ltd., which, under Sir Harry McGowan, was one of the four participants in the formation in 1926 of Imperial Chemical Industries, Ltd. The story is ably told in detail in the current issue of the *I.C.I. Magazine*, describing how Alfred Nobel was first cold-shouldered by the English black powder manufacturers and finally enabled to betake himself and his little-appreciated dynamite formula to a hundred acres of near-desert at the estuary of the Clyde. " The most depressing place in the world . . . everlasting bleak dunes . . . only the rabbits find some nourishment, eating a substance which quite unjustifiably goes by the name of grass." he wrote to a friend. That was Ardeer, first home of the British Dynamite Co. and to-day one of I.C.I.'s " chemical cities," from whose research laboratories have come not only explosives infinitely more potent than dynamite, but peaceful products for paints and finishes, agriculture and textiles which would have rejoiced the repentant dynamite man who founded the Nobel Prize award.

Leather Trades' Review

THE 80th anniversary of *The Leather Trades' Review* (a sister journal of THE CHEMICAL AGE in the Benn group) is commemorated by a special number in which progress in the leather industries in the last eighty years is recorded. In an interesting article on " Tanning Conditions in 1867 " mention is made of the first work on synthetic tannins by Hatchett in 1800. Hatchett reported : " Having by means of nitric acid obtained solutions from asphaltum, from jet, from several of the pit coals, and from charcoal, I evaporated them to dryness in separate vessels, taking care in the latter part of the process to evaporate very gradually, so as to completely expel the remainder of the acid without burning the residuum, this, in every case, proved to be a brown glossy substance which exhibited a resinous fracture." The chemical properties of these residua were as follows: They were readily soluble in water and alcohol and were highly astringent. Solutions of glue or isinglass were immediately precipitated to give insoluble precipitates and the general behaviour indicated that they were new types of "tannin." One hundred years were to pass before any use was made of his invention. The use of caustic soda was, in 1860, known for depilation and mention is made of the use of "hydrosulphuret of calcium." The suggestion was made that this product should be prepared by supersaturating a very thick milk of lime solution with sulphuretted hydrogen gas. It was admitted that the process could be unpleasant for the worker, but in defence a quotation from the Encyclopedia of Chemistry was used to the effect that, "although offensive, it may be inhaled by men without apparent injury. The effect upon one workman was a pleasant (*sic*) lethargic feeling, etc., etc." Other amusing and interesting items of a chemical nature are given in this Anniversary Number. We congratulate *The Leather Trades' Review* on its 80th birthday and wish it another such period of healthy progress.

The Leaden Curtain

TO find oneself in agreement with Mr. R. Edwards, general secretary of the Chemical Workers' Union, is not an everyday occurrence. His resolution at the Trades Union Congress at Southport recently calling for relaxation of the "hush-hush" policy which has withheld practically all information since Government schemes for the peacetime exploitation of nuclear fission began will, however, find a sympathetic response in circles wider than the T.U.C.—which remitted the resolution to its General Council. The trade union secretary's case was based on claims that the present secrecy limits trades unions' ability to safeguard members' interests and discourages recruitment of scientists and workers for vital work, and he asked that the Government should be pressed to facilitate an official inquiry into the operation of atomic research stations and laboratories and the conditions under which workers were called upon to serve. His rider that the time had come "to choose between atomic death and Socialist life" was on more controversial ground, to say the least of it, but may be safely disregarded as being merely a political decoration suitable to the occasion, regardless of its irrelevance. Somewhat similar views about the lead curtain which surrounds atomic affairs have previously been expressed in quarters sufficiently diverse to indicate that this is no partisan view, and, while in present circumstances every precaution is certainly being taken to safeguard workers, publicity is the best assurance that there is no relaxation of those vital conditions and, of equal importance at the moment, that no opportunity is being lost of pressing forward the practical applications of this potent source of energy. How meagre is the information not only of the "man in the street" but of most of the men in our laboratories as well was underlined by the exclusion of the subject at the recent Chemistry Congress and by the news value attaching to the statement made at the Hague last week by the Didcot station's director of research, Prof. John Cockcroft, that experimental atomic power units might be in use within three to five years. Our darkness is profound and too prolonged and should be relieved now as far as international security permits.

Chilean Copper and Fertilisers

A report from Chile states that exports during the second quarter of 1947 included 50,000 metric tons of electrolytic copper, 5000 tons of nitrate of soda and 3500 tons of sulphate of soda. A brisk demand for the latter product continues. Advices from Iquique refer to the success of experiments which have been carried out locally in connection with the enrichment of nitrate of soda with potash to produce potassium nitrate of great fertilising value. The cement industry is to be expanded by the establishment of several new factories, and Chile may be in a position to export about 50,000 tons of this product per annum, although it is understood that one factory is suspending production attributed to lack of storage space and to shortage of coal.

CONTROL OF ENGAGEMENT ORDER

Chemists' Position Obscure

FROM the newly amended Control of Engagements Order—occasioned by the critical economic situation of the country and the consequent need for an all-out export drive—which comes into force on October 6, it is not clear whether qualified chemists are or are not liable to direction in the event of their becoming unemployed or wishing to make a change.

Ambiguity

One class of excepted persons, described somewhat ambiguously in the Order as "managerial, professional, administrative or executive," would seem to include qualified chemists, but this is by no means certain—as inquiries made by THE CHEMICAL AGE have revealed. The Ministry of Labour has informed us that a "clarifying" list of professions exempt from the provisions of the Order is being prepared, and will be made available shortly. Meanwhile, the old Order included qualified chemists who transferred from one post to another via Appointments Offices of the Ministry of Labour.

The Control of Engagement Order, 1947, was made on September 18, 1947, under Regulation 58A of the Defence (General) Regulations, 1939, and comes into force on Monday, October 6, 1947. It will expire at the end of 1948.

With certain exceptions, all men aged 18 to 50 inclusive, and women aged 18 to 40 inclusive, are covered by the Order.

Restrictions Imposed

An employer may not engage or even seek to engage (*e.g.*, by advertisement, poster, or circular letter) any worker to whom the restrictions apply, otherwise than through a local office of the Ministry of Labour and National Service or an employment agency approved for the purpose. Similarly, workers must obtain their employment through a local office of the Ministry or approved employment agency.

Advertisements and notices of vacancies are only allowed if they clearly state that they invite applications only from excepted persons, *e.g.*, boys and girls under 18; women of 41 and over, or men of 51 and over. Newspaper advertisements may be published in a column bearing a cautionary heading, restricting the vacancies to persons or employments excepted from the provisions of the Order.

Exemption certificates may be issued by local offices to employers permitting them to advertise for and engage workers direct. Such certificates would be subject to conditions, *e.g.*, restricting the employers as to the number and type of workers who may be engaged or advertised for.

Certain persons are free to be engaged directly for employment. They are persons outside the age limits; women with children of their own under 15 living with them; members of H.M. Forces and women's Services during the period of their paid resettlement leave.

Certain employments can also be taken without reference to a local office of the Ministry or approved employment agency, including part-time employment for not more than 30 hours weekly, whether with one or more employers; employment in a managerial, professional, administrative or executive capacity.

The restrictions also apply to engagements in this country for employment abroad.

The interests of directed persons are safeguarded by the existing Control of Employment (Directed Persons) Order, 1943, which provides that the employer may not dismiss a directed person (except for serious misconduct) while the direction is in force.

More detailed information about the Order will be contained in a leaflet "Notes for guidance on the restrictions imposed by the Order," copies of which will shortly be available on application to the Ministry of Labour and National Service (L.S.28), 15 Portman Square, London, W.1.

Chemical Trading Increased

A CONTINUOUS increase in U.K. imports and exports of chemicals and allied materials is a feature of the Board of Trade summary of imports and exports in 1947. Average monthly values of chemicals, drugs, dyes and colours imported in the first quarter of the year were £1,463,000 and in the second quarter £2,229,000. Imports in July were worth £2,404,000 and in August £2,530,000. Exports of chemicals, drugs, dyes and colours in the first quarter of the year averaged £5,804,000, in the second quarter £5,241,000 and in July jumped to £7,171,000. August's total was £5.555,000.

Swedish Import Changes

The Swedish Government has decided further to curtail the free list for imports. Consequent upon this decision, announced last week, import licences have now to be obtained for all minerals including coal and oils, chemical products, steel, etc. Some chemicals, however, may be imported without licence.

INDUSTRIAL DERMATITIS

Causes and Prevention Reviewed

AMPLE cleansing facilities, substitution of mechanical for manual processes wherever practicable and enclosed methods of manufacturing are among the principal safeguards to be observed in reducing the incidence of industrial dermatitis—the most widespread of occupational diseases, which is the subject of a very comprehensive review recently made by the Technical Service Department of Aero Research, Ltd., Duxford, Cambridge.

The most injurious industrial substances in this connection are given in order of toxicity as: 1, Petrol products; 2, alkalis and their components; 3, fat solvents and degreasing agents; 4, metals and metal plating compounds; 5, lubricants, soluble and insoluble; 6, paints and paint solvents; 7, chromates and chromic acid; 8, dyes; 9, synthetic resins; 10, rubber and its compounds.

Risks with Formaldehyde

Special attention is given in the survey to the ninth item, synthetic resins, the most damaging constituent of which is formaldehyde, which irritates the mucous membranes and is capable of causing also conjunctivitis, pharyngitis, laryngitis and bronchitis. Free phenol, especially in conjunction with caustic soda, is especially injurious to the skin, the respiratory and intestinal track.

Of formaldehyde, it is noted that both the fumes and the liquid are capable of causing dermatitis. Any damage to the skin of the hands or forearms greatly increases the risk, and allowing traces of the synthetic adhesive to dry on the skin is another fruitful source of trouble. Notwithstanding the injurious effect of fumes (20 parts of fume per million in the atmosphere is stated to be the limit of safety), the increase of skin disease of workers with cold setting glues is higher than that of those engaged with hot materials.

Safeguarding the Skin

The survey quotes the official memorandum on the Prevention of Industrial Dermatitis which bases preventive measures under two primary heads:—

(1) The glue, of whatever composition, must be prevented from remaining in contact with the skin longer than is absolutely necessary, and in any case not long enough to harden.

(2) All traces on the skin of chemicals developed during glue action must be removed or rendered inert before leaving work.

To achieve these conditions the memorandum recommends:—

(a) Frequent cleaning of the fingers on a damp swab of loosely woven stockinette or other readily absorbent material which does not present a harsh surface to the skin.

(b) Regular application, before work, of a suitable barrier cream.

(c) Use of a chemical neutraliser to remove formaldehyde or alkali from the skin (*e.g.*, sulphite soap).

(d) Thorough washing, with ablution facilities *near to the gluing operations,* and a supply of clean towels for effective drying.

Special Susceptibility

Of special interest in the Aero Research study of causation is the statement that: Experience gained from personnel using synthetic resin adhesives has shown that some individual workers, even certain types of workers have a tendency to contract dermatitis more readily than others. Such people are said to be allergic, and this is another factor to be taken into consideration when the causes of dermatitis are assessed.

As far as types of worker can be roughly classified, according to the degree of susceptibility they exhibit, it may be said that women are more likely to become affected than men. Women have usually less greasy skins, which have a slightly higher *p*H, *i.e.*, skins which in general show a slightly lower degree of acidity. Fair people are more susceptible to sensitising agents than dark, and fat solvents are more irritating to dry skins than to oily ones.

Psychology of Dermatitis

A further factor to which insufficient attention has been given is the psychological aspect of dermatitis, which, it is stated, is often the result of emotional stress. ' Wartime direction of labour brought in its wake a vast number of cases of industrial dermatitis which did not respond to routine medical treatment, and many of these were found to have been associated with the strain of domestic and other problems. . . . While the diagnosis and treatment of such cases is a matter for the specialist, it is worth while considering whether some persons subject to constantly recurring attacks of skin disease are not, in fact, the victims of their own emotional make-ups." The result of transferring such a patient to work where no risk of dermatitis exists is suggested where the possibility of compensation arises.

Chemicals Used for Glass Colouration

COLOURED glass is in extensive demand for scientific apparatus, signalling lamps, photographic filters and other equipment. For this a standardised product is needed which can only be produced by a knowledge of the chemical reactions involved and careful control of the manufacturing processes. In an article on "The Chemistry of Glass Coloration" in the July issue of *Endeavour*, which is beautifully illustrated with coloured plates, Mr. L. M. Angus-Butterworth deals with the different chemicals used since early times for the colouring of glass.

According to the author there is a longer history of coloured glasses than of the transparent variety. Pieces of coloured glass have been found in Egypt bearing the name of a king living in 5000 B.C. while transparent glass did not appear there before about 660 B.C. One of the first uses of coloured glass in England was in cathedral windows.

Cathedral Glass

The common belief that we do not know today how to reproduce the brilliant colours of the early cathedral windows, was partly true up to about a hundred years go, writes Mr. Angus-Butterworth. But today, he avers, the glass technologist knows far more about colours in glass than was ever known before. He points out that the old cathedral glass when originally placed in position was often very crude in colour and dark in shade. It has taken hundreds of years to become mellowed. The steady abrasive action of rain driving against the glass through the centuries, and the chemical dissolving action through the slight acid content of much of our rain water, especially in towns, has gradually changed thick and comparatively dark glass to glass which in some cases is as thin as tissue paper and which now has light and vivid colours.

Even the impurities in the metals, he adds, which the early glassmakers could not control, gave variety to their products. In a variety which is not now possible as glassmaking materials and processes are so carefully and completely controlled that results are, or should be, well ascertained in advance.

Among the agents for the production of the common colours in glass, Mr. Angus-Butterworth mentions cobalt and nickel oxides, used together, as giving opaque black glasses, and cobalt and copper for colouring glasses blue. Cobalt is the more commonly used, although it transmits a deep red band in addition to blue. Accordingly if a cobalt blue is combined with a copper bluish-green, the latter absorbs the red and an excellent blue glass is obtained. Copper with a small amount of iron will give a colour midway between blue and green. It has been found that potash glasses give a purer blue than the corresponding sodium glasses, and that borosilicates yield a reddish hue.

An interesting modern use of cobalt is mentioned by the author. If small amounts of cobalt, manganese and copper oxides are used together in the batch, what is now known as the daylight effect is obtained. What happens is that these oxides eliminate part of the light from the artificial light sources, and the filtered remainder more closely resembles natural sunlight.

For the production of green glasses iron, copper and chromium are employed. Other substances, such as stannic oxide, are very rarely used. The presence of 0.23 per cent Fe_2O_3 gives an almost colourless glass which is greenish-blue in thick layers; 0.48 per cent a light sea-green; 0.73 per cent a bright sea-green; 1.23 per cent a bright yellowish green, but still transparent; 8.23 per cent a dark olive green, still transparent even in thick layers; 11.12 per cent a dark olive green but opaque in thick layers.

The colours given by copper depend upon the conditions under which the glass is melted. A blue or green glass is obtained from copper compounds under oxidising conditions, and a ruby colour under reducing conditions. For green glasses the black or cupric oxide is used.

Grey ("Smoked") Glass

To produce grey or "smoked" glass the colouring agents used are combinations of (a) cobalt, nickel and uranium oxides, or (b) manganese, iron and copper oxides The glass may be of either the soda-lime or lead-potash type.

In most opal glasses the opacity is dependent upon the separation of either finely divided silica or some metallic oxide, or both, from the mass of the glass. The separation is assisted by the presence of fluorides and phosphates. A certain degree of opalescence may result from the separation of the fluoride or the phosphates themselves from the glass, but as a rule the batch is such that they remain combined as fluo-silicates and phospho-silicates, throwing the silica out of solution. The source of the. opal colour in glass therefore may be either excess of silica, excess of a metallic oxide, *e.g.*, of aluminium, tin or antimony, or the presence of fluorides or phosphates.

According to the author, compounds of manganese, which give a purple colour, are among the oldest colouring agents used in glass. To secure a deep colour with manganese the founding has to be under oxidising conditions, as reducing agents destroy the purple tint.

Copper Oxide

Copper oxide in the cuprous form, melted under reducing conditions, gives an excellent ruby. If a copper ruby is reheated slowly for some time the particles of copper aggregate and become visible to the naked eye, giving a semi-opaque glass filled with golden yellow spangles. When a gold ruby glass is made today, which is not often, it is generally prepared from a soft lead batch containing an excess of antimony and arsenic. The gold is added in the form of a solution of gold chloride in the proportion of 1 oz. of metal to 200 lb. of batch.

Although selenium is now being used as a source of red colour in glass, the colour is difficult to retain because of the tendency of selenium to volatilise.

Colours ranging from violet to purple can be obtained by adding less than one per cent of titanium dioxide to the batch mixtures of certain borosilicate or phosphate glasses.

Spectral Yellow

At present, according to Mr. Angus-Butterworth, it is believed that no single element can be used to isolate spectral yellow in glass. Glasses of varying shades of yellow are, however, produced by means of cadmium, silver, sulphur and uranium. Carbon is commonly used in the manufacture of yellow glasses, being introduced in the form of coke, graphite or anthracite. It is the sulphate-containing impurities in the carbon which are the true source of the colour.

For amber glasses it is usual to employ a mixture of sulphur and charcoal. Experiments have led to the conclusion that only polysulphides, polyselenides or polytellurides will give yellow colours, although a stable yellow can be obtained with sodium uranate, or with uranium plus antimony in glasses containing lead.

SCOTTISH PEAT PROSPECTS

EFFORTS are being made in Scotland to influence the Government to accept a policy of development of peat resources, so far with small success, although the Government has announced a limited start in certain areas. The argument advanced by the Scottish interests is that Denmark and other Continental countries have proved that peat can fulfil many of the functions of coal, oil and even petrol. The Danes are running cars on peat charcoal.

Although the Scottish Office is known to be studying the subject, it is believed that they have merely compiled a mass of information, most of which was already available. Three small schemes have been launched, but only on a limited manual scale.

Major Scheme Required

What is demanded by the peat enthusiasts in Scotland is a major scheme with all the allied mechanisation, by-product industries, transportation and other facilities which such a major venture will demand. The attitude of the Government would appear to be that any revival of the coal industry would make such a mechanised scheme uneconomic.

Whether the Government is justified in banking on a revival of ample coal, remains to be proved, but the peat experts claim that recent economic trends have shown that the balance of economic favour has moved entirely towards the peat industry.

Peat could be harvested on a major scale by mechanised methods and at a price which could compete successfully with a revived coal industry.

Apart altogether from this, the fact that 5000 million tons of peat remain unexploited is regarded as a grave injustice to Scottish economy. The Scottish Reconstruction Committee is demanding now the systematic reclamation of land, the production of solid, liquid and gaseous by-products, and the generation of power.

ATOMIC ENERGY PLANS CRITICISED

SIR ROBERT RENWICK, chairman of the County of London Electric Supply Co. and a director of other electricity supply companies, addressing a meeting of the Society of Individualists and National League of Freedom under the presidency of Sir Ernest Benn in London last week, urged the Government to allow industry to take a greater part in the development of industrial use of atomic energy. Foreseeing a second industrial revolution developing from the use of atomic energy, Sir Robert reproached the Government for its apparent reluctance to take British industry fully into its confidence. Atomic energy development in this country was a State monopoly, and as such was red-taped; industry in this country was being kept in the dark as to what was happening. By contrast, he said, American industry is fully conversant with atomic progress.

On the subject of coal allocations, Sir Robert warned that though the Government might see to it that power stations received their full supplies, the lack of coal for railways and other key industries might well be disastrous. With regard to coal production, he said that if the nationalised coalmines produced as much coal per man hour as they did in pre-war years under private enterprise with less up-to-date equipment, there would be world-wide sterling demands.

GAS PRODUCTION AND THE CHEMICAL INDUSTRY*

by Dr. J. S. van AKEN

THE United States of America, being fortunately endowed with natural gas in abundance, has no problem to solve in the supply of a cheap gaseous fuel for industrial and domestic purposes. In Western Europe on the other hand natural gas is found only sporadically, so the gaseous fuels must be obtained from coal.

In the chemical industry gas is needed as a raw material for the manufacture of numerous products. In other sections of industry, certainly for the production of high-quality products, gas is indispensable. Any increase of national prosperity involves a greater demand of gas for domestic purposes. This requires, certainly in Western Europe, the extension of gas production on a large scale. The present coal shortage urges immediate examination of the manufacture, transport and distribution of gas. Successful co-operation between the chemical industry and the public gas supply services may contribute considerably to the solution of this problem.

Situation in the Netherlands

Since radical changes have been necessitated in the Dutch gas economy—to the realisation of which both the chemical industry and the public gas supply services are co-operating closely—it may be interesting to give details of the situation in the Netherlands.

At present, there are about 130 gasworks in Holland, some being very small. These gasworks have a record of distinguished service, but their growth and technical development have long since ceased. On the other hand there are a few large coke-oven plants of quite recent date which are in a state of steady extension and technical development Gas supply from a gasworks is limited to the area adjacent, where the gas is used mainly for domestic purposes, industrial applications being restricted.

The coke-oven works are integrated either with blast furnace works or with collieries, and are combined at the same time with chemical works and power stations. As the coke-oven works are part of two big industrial combines, the internal gas economy is complicated. Moreover, these coke ovens have entered the field of public gas supply, and supply gas by means of a long distance grid to an area which is being steadily extended. The gas consumed in that area is used mainly for domestic purposes; a considerable part, however, is used in industry.

This is, in brief, the present situation. How did this situation arise?

At the time when the coke-oven plants were built, practically every town and every municipality had already operated smaller or larger gasworks for several years. Consequently the coke ovens found the field of public gas supply occupied.

That was evidence indeed of the abundance of fuel our national economy had at its disposal in those days. There was no need for using these big quantities of gas for the public gas supply. While in coke-oven plants the gas was used only for the generation of steam and thence of electricity, in most gasworks products such as benzol and toluol were not recovered. The innumerable possibilities then already existing for the manufacture of various useful substances from these constituents of gas were not exploited, chiefly because the market was flooded with benzol, toluol and similar products.

Because a sufficient outlet for coke-oven gas could not be found through the public gas supply, and since the use of the gas for generation of electricity was only of low efficiency, a very cheap raw material was placed at the disposal of the chemical industry. Nitrogen fixation plans arose adjacent to coke ovens. Hydrogen was extracted from the coke-oven gas, and after being converted into ammonia, served for the preparation of various nitrogen fertilisers. Reaction gases of very high purity and of constant composition were produced for this purpose by the chemical industry.

Quality of the Gas

To obtain the hydrogen, the coke-oven gas must be separated into its components. From a technical point of view this separation process gives rise to difficult problems. It soon appeared that the complicated process of separating the gas could be successfully performed only if a gas of constant composition were available, from which the various disturbing impurities had been eliminated. The results achieved by the constant efforts to improve the quality of the coke-oven gas proved to be very valuable also for the public gas supply. They made a notable contribution consequently to the delivery of energy to other sectors of industry.

It would carry us too far to detail the various technical discoveries and improvements that have been made. A single example will suffice to show how simple measures have led to valuable results. Coke-oven walls are built from refractory brick and from their nature are not gas-tight. In order to avoid loss of gas, the oven was kept under slight vacuum, and air and waste gases found their way into the oven chamber, thus diluting the coke-oven gas which the chemical industry had to use as a raw material.

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* Read before the Fuel Economy Conference held recently at The Hague.

Explosions took place in some similar nitrogen plants abroad, and it was then discovered that the gas contained traces of nitric oxide and that this small impurity was responsible for the trouble. To remove this impurity it became necessary to operate the coke-oven chamber under a slight pressure. It was then found that the gas leaking through into the oven chamber was cracked when passing over the hot oven wall, resulting in carbon deposits in the pores of the oven walls, whereupon leakage ceased. In this manner a gas of higher calorific value and of constant composition was obtained.

A coke-oven plant linked to a chemical industry must produce a purified gas of high quality and uniform composition, because the slightest variation in the quality of the gas may disturb the regular performance of the separating apparatus.

Effect on Other Industries

With the rapid increase in coke-oven plants such large quantities of gas were manufactured that the chemical industry could not entirely absorb these quantities. The large surplus had to be burnt under steam boilers, but it could better have been sold to various industries at low prices.

These industries were able to avail themselves of the new possibilities. In the ceramic industry, in the manufacture of filament lamps and radio tubes and in the iron and steel industry new methods were developed. These methods could not have been adopted if either producer gas or normal town gas had had to be used. The ceramic industry could now change over to a method of continuous burning of their wares in tunnel kilns without using saggars. Vitreous products could be manufactured in a single burning operation and there was a wider choice of enamel and glazes. In the manufacture of filament lamps fully automatic machinery of an elaborate type could be applied.

All this proved to be feasible because of the very pure and constant quality of the gas.

New Prospects for the Gas Industry

By compressing the gas immediately after the de-tarrer, the hydrocarbons and ammonia can be recovered in a better and easier way, and by so doing inconvenient constituents such as hydrogen cyanide and hydrogen sulphide may be converted into valuable raw materials for the chemical industry.

Hitherto it has been customary to recover the tar and the ammonia from the crude coke-oven gas at atmospheric pressure and afterwards to compress that part destined for the chemical industry and the public supply. Now that a stage has been reached at which practically the whole of the coke-oven gas is consumed by the chemical industry and the public gas supply, it is obviously preferable to compress the crude coke-oven gas immediately after it has been de-tarred. This procedure creates new possibilities for the purification of gas. The ammonia solution can now be made to contain 9 per cent of ammonia, whereas previously a foul liquor containing hardly 1 per cent of ammonia resulted. This process abolishes the necessity of fixing the ammonia by means of expensive sulphuric acid, and the concentrated ammonia liquor can now be worked into more lucrative products.

Steam Consumption Reduced

When operating this process the consumption of steam for the recovery of ammonia and hydrocarbons will be drastically reduced. Whereas when working at atmospheric pressure the elimination of hydrogen cyanide and hydrogen sulphide entails high expenditure without any compensating profits, the high-pressure process makes it possible to recover these ingredients in concentrated form, so that the nitrogen fixation plant connected to the coke ovens can convert them into valuable products.

When working at high pressure the naphthalene can be eliminated completely, so that troublesome deposits in the mains and apparatus will be avoided. A substantial saving in steam can thus be effected, while more useful products and a less corrosive gas of higher purity are obtained.

The expenditure involved in compressing the gas, expenditure which cannot be avoided as the gas must be compressed for the chemical works and the public supply, is therefore balanced by the profits acquired in consequence of the better purification of the gas.

(To be continued)

I.C.I. Expansion in Australia

According to the Australian Trade Commissioner here, the Imperial Chemical Industries of Australia & New Zealand, Ltd., has decided to extend its alkali works at Osborne, South Australia, at a cost of more than £1,000,000. Nearly all the cost of the extensions will be spent in Australia. It is planned to complete the work in two years. The limestone quarries will be extended to permit the extraction of 200,000 tons of limestone a year, and the salt fields, which already cover an area of five square miles, will be extended to provide for the 200,000 tons a year capacity of the new plant.

LEVER PROJECT IN MALAYA

IT has been disclosed that Lever Brothers and Unilever envisage the construction of a £500,000 factory at Kuala Lumpur, Malaya, for the manufacture of high-quality soaps, margarine and other edible fats. An announcement to this effect was made last week by Mr. Geoffrey Heyworth, the company's chairman, who has recently been visiting the island with two other directors. It is understood that erection of the factory will commence just as soon as permits for the specialised machinery can be obtained in Britain.

An integral part of the plan is the development of Malaya's palm oil industry, in which connection the company has already acquired a 4000-acre estate. About 75,000 acres of the island are at the moment growing oil palms, and Mr. Heyworth thinks that this acreage is capable of being multiplied many times.

OFFICIAL NOTICES

Key Industry Exemptions

The Treasury has made an Order exempting butyric acid, normal and cellulose acetate, from Key Industry Duty for the period beginning September 18, and ending December 31, 1947. The Order is entitled "The Safeguarding of Industries" (Exemption) (No. 6) Order, 1947, and is published as Statutory Rules and Orders, 1947, No. 1960.

Flavouring Essences

The Minister of Food has made an Order revoking the Flavouring Essences (Current Prices) Order, 1943, from September 23, 1947, and from that date the selling prices of flavouring essences will no longer be subject to control. This step has been taken as a result of improvements in the supply of the main ingredients.

Tung Oil

The Board of Trade announces that from October 1 tung oil will revert to private trade. The Control of Drying Oils Order, however, remains in force, and general licences from the raw materials department, Board of Trade, will still be required by those dealing in or consuming tung oil.

Obituary

MR. JOHN ANDERSON KIRKWOOD, managing director of Allan Kirkwood, Ltd., lime manufacturers, Nitshill, Glasgow, died at his home, 7 Marywood Square, Glasgow, S.1, on September 17. Mr. Kirkwood had been associated throughout his working life with the family firm, and was very well known in the industry. He is survived by Mr. Ramsay Kirkwood, a brother, also a director of the firm, and a son, Mr. John Kirkwood.

MORE PLANT FOR CHEMICAL INDUSTRY

SPEAKING last week at the 40th ordinary general meeting of Peter Brotherhood, Ltd., Mr. A. M. Neal, the chairman, said that the company had orders in hand for gas compressors, chemical plant, refrigerating machinery, etc., sufficient to occupy them for many months to come. In common with industry generally, however, "the absence of adequate supplies of materials tends to build up a large volume of unfinished work," he added.

With regard to the export drive, Mr. Neal said that in conformity with the Government's wishes, the company had given priority to the class of work which had a bearing on that subject or on the establishment of new industries in Britain. "Indeed," went on Mr. Neal, "we intend to continue to place a large proportion of the facilities to which I have referred at the disposal of the chemical industry. At the moment, some 75 per cent of the work in hand is for export direct, or for use in connection with manufactures intended for the export market."

NEXT WEEK'S EVENTS

WEDNESDAY, OCTOBER 1

Society of Chemical Industry (Glasgow Section). Central Hotel, Glasgow, 6 p.m. F. W. Tennant: "Tennant Memorial Lecture."

Society of Public Analysts and Other Analytical Chemists. Burlington House, Piccadilly, W.1, 6 p.m. Bernard H. Howard: "The Determination of Small Amounts of Hexachlorocyclohexane (Benyene Hexachloride)"; J. H. Skelton and E. D. Wills: "Iodimetric Methods of Estimating Peroxide Oxygen"; B. Bagshawe and J. D. Hobson: "A Study of the Cobalt-Ferricyanide Reaction, With Relation to the Determination of Cobalt in Steel."

THURSDAY, OCTOBER 2

Oil and Colour Chemists' Association. The Royal Institution, 21 Albemarle Street, W.1, 6.30 p.m. Sir Lawrence Bragg: "A Review of Recent Advances in X-Ray Analysis."

The Chemical Society. Burlington House, Piccadilly, W.1, 7.30 p.m. Professor F. G. Donnan: "Ernst Julius Cohen Memorial Lecture."

FRIDAY, OCTOBER 3

Society of Chemical Industry. (Manchester Section). Engineer's Club, 17 Albert Square, Manchester, 6.30 p.m. Sir Percival J. Griffiths: "India and the Future."

Oil and Colour Chemists' Association

LONDON SECTION MEETING

AT the first meeting of the London section of the Oil and Colour Chemists' Association this session, held at Manson House, 26 Portland Place, W.1, on Thursday, September 18, Mr. David E. Roe, delivered his address as chairman of the section.

At the beginning of the meeting the members observed a period of silence in memory of the late Mr. Peter Hewitt, who died in August after a long illness. The chairman paid tribute to him as a man who undoubtedly would have gone a long way in the industry. He was an intensely likeable man, his scholarship was of the highest level, and he had in him all the qualities that made him a good fellow and a good chemist. His loss was indeed a serious blow to the association and the industry.

Mr. Roe said that although he had been actively engaged in the affairs of the London section for some years past, the honour that was now paid him had caused him to examine the activities of the section far more closely and more critically than he had ever done before.

World-Wide Connections

It was the privilege of the London section to be the largest in a rapidly growing association, he said, which had world-wide as well as national ramifications. It was fitting at the first meeting of a new session to send warm greetings to the other sections, to Manchester and Scotland, to Bristol, Hull and Newcastle, and to the overseas section, whose membership included some of the most distinguished scientists in the industry in practically every civilised country in the world. London would also like to send good wishes to the youngest section, in Australia.

It was more than probable that before long a South African section of the association would be formed. It was his earnest hope that, before many years had passed, there would be brother sections in most of the countries of the Empire.

It was also very gratifying to know that, thanks to the inspiration and foresight of Dr. H. W. Keenan on this side, and Dr. Joseph Mattiello in the great American Republic, a close and happy liaison had been effected between the association and the American Federation of Paint and Varnish Production Clubs. Such contacts strengthened and increased the value of both bodies and served to put in their proper place the very small but very noisy minority on both sides of the Atlantic who seemed to think that tail twisting was the most desirable object in life.

After emphasising the great importance of maintaining the closest liaison with other scientific associations and other organisations serving the industries, and of giving the polytechnics as much help as possible, Mr. Roe discussed the human side of affairs and said he always liked to keep well in mind that if we were 5 per cent chemists we were 95 per cent ordinary common or garden human beings. As chemists, trained in the scientific method, we could lay claim to no special faculty which enabled us to solve all problems with greater competence than the rest of mankind. If a criticism were to be levelled at many of them it might well be that they concerned themselves with their own professional affairs to the exclusion of most other activities. Undoubtedly there was a need for many chemists to withdraw from themselves.

In a discussion which followed the chairman's address, Mr. Neil R. Fisk recommended publication of more information concerning the investigations that were proceeding, and quicker publication. Various O.C.C.A. investigations were proceeding, and he would welcome the publication of interim reports with regard to them, to create and maintain more interest.

Wider Knowledge Urged

Mr. R. F. Baker, emphasised the importance of gaining knowledge on subjects other than chemistry. One heard, he said, from time to time that chemists were often ambitious to attain high executive posts. Before they could attain such posts, however, they must not only know how to make the best materials, but whether they were suitable for their purpose, whether they could be manufactured or even whether anybody would have enough money to buy them.

Referring to the co-operative research scheme, Mr. E. Sunderland said that many of the subjects chosen were such that necessarily quite a long period must elapse before reasonable results became available for publication, and that might result in lack of interest. Therefore, he suggested that some smaller scale research might be attempted. Members might suggest from time to time quite small pieces of work which could be done perhaps in two or three weeks by one or two laboratories, so that the results would soon become available.

To Dr. R. F. Bowles it seemed that a strong case could be made out for running two rather sharply differentiated sorts of meetings in the London section. They were bound to have scientific papers; but in addition they might revive the old discussion meetings which were held in London before the war.

British and German Chemical Industries

THE British chemical industry was not consulted directly or indirectly before the scope of postwar German chemical activity was decided at the quadripartite conference in Berlin in 1946. It was, moreover, very difficult today to obtain any precise information about what was happening in the German chemical industry.

These were two of the points made by Mr. J. Davidson Pratt, director of the Association of British Chemical Manufacturers, when recently he addressed the general committee of the Parliamentary and Scientific Committee on "The Future of the Chemical Industry in this Country, with Reference to Competition from Germany."

Not Marvellous Chemists

The Germans, Mr. Davidson Pratt pointed out, were not "marvellous chemists.' They were not particularly brilliant and could not claim as high an average of fundamental and original discoveries as this country, but their industry was very much quicker in applying results. I. G. Farbenindustrie with its world-wide ramifications, had been very quick to slip in on any new discovery and ring it round with patents, making it almost impossible for the inventor to develop his invention.

The object of the plan agreed by the Berlin Commission was to eliminate or restrict industries which were regarded as the greatest war potential, but at the same time to allow Germany sufficient capacity to maintain the standard of living, and to export enough to pay for imported food and materials.

In the chemical field, the manufacture of synthetic gasoline, oil, rubber and ammonia were to be prohibited. There was a proviso in the case of ammonia that Germany would be allowed to manufacture sufficient for fertilisers, etc., until she had exports to pay for the imports. Specific war chemicals were prohibited entirely. She was to be allowed 40 per cent of the 1936 capacity of basic chemicals; 20,000 tons of dyestuffs were allowed for home consumption, and she could export dyes as such to the value of Rm. 58 million (approximately £4.7 million) about half her pre-war exports. This is comparable with the British 1946 dyestuff exports of £6.5 million.

In the pharmaceutical field, Germany was to be allowed to make 80 per cent of her 1936 output, of which Rm. 120 million—practically pre-war value—could be exported. This is equivalent to £10 million and is comparable with the U.K. 1946 export of £13 million.

With the shortages of coal, etc., it would probably take Germany five years to reach this level of production, but they were starting to develop, particularly in the pharmaceutical field, where they got a very high return.

The chemical industry felt that in allowing the German chemical industry to be re-established on a 1936 basis, it was re-establishing the industry with the greatest war potential. That war potential was derived not merely from the plant and equipment, but from the great army of technicians of all kinds which it could employ, and which she could use to produce all kinds of things. It would be a menace to future international peace.

It had been hoped that as a result of the Level of Industry Plan a good many German factories other than those specially designed for explosives would be taken for reparations, and a good deal of useful equipment become available. So far, not one piece of chemical equipment had come to this country, in spite of the fact that six teams had been sent out at the end of 1945 and had made recommendations as to equipment to be secured.

Home Industry Prospects

Dealing with chemical production here, Mr. Davidson Pratt said that the industry could never remain static, and was always moving forward. It was seeking better methods and producing new compounds which might revolutionise the world's economy. The President of the Board of Trade had said that the chemical industry provided the highest productivity per worker.

Before 1914 we had a very good heavy chemical industry, but on the organic side—dyestuffs, pharmaceuticals and other fine chemicals—we were in very poor shape. By brilliant but costly improvisation we were able to make our way through the 1914-18 war, with the good result that it was recognised nationally that the chemical industry, particularly the organic chemical industry, was a key industry essential to this country.

Two legislative measures were passed—the Dyestuffs (Import Regulation) Act, which covered dyestuffs, and the Key Industry Duty, which applied to fine chemicals. In connection with the Dyestuffs (Import Regulation) Act, which was appreciated not only by the makers but even more by the users of dyestuffs, it was feared that as a result of the agreement reached at Geneva in regard to abolition of prohibitions, the Dyestuffs Act would have to go, and we should have to take instead a Key Industries system which, though valuable, had not the merits of the Dyestuffs Act.

When the war ended the chemical industry was stronger than it was before, but a lot of the plant and equipment had been worn out. It wanted modernisation, and that was one of the problems on which the industry was very much engaged at the present time.

Chemical Industry Development

Many research results which could not be developed during the war were now being brought to production. Millions of pounds were being spent on schemes for the development of the chemical industry, but apart from the difficulties of coal and steel, they were very badly retarded in their development work through lack of building facilities, plant, etc. Many in the industry felt that at the present time, when there was an imperative need to re-equip our own industries, it was a great pity that plant should be sent overseas to equip other industries to become competitors.

Imports in 1946, allowing for changed values, were about 80 per cent of 1938 imports by volume. Exports in the chemical industry took two forms: (a) the direct export of chemicals themselves· (b) the indirect export, which was even more important, in which chemicals were used—for example, dyed textiles.

The policy now was to see that our home industries were supplied with all the chemicals they needed, before chemicals were exported. In spite of severe restrictions, in 1946 the chemical industry increased its exports more than any other industry, with the exception of vehicles. Their figures, by value, in 1946 were three times the 1938 value, totalling £68 million.

Swiss Instruments Cheaper

In the course of general discussion later, Dr. J. Vargas Eyre deplored the fact that Germany was to be allowed to manufacture synthetic ammonia and urged that British manufacturers should be more fully informed in future upon what else Germany was to be allowed to do. Mr. Davidson Pratt said that the industry had been promised consultations to advise on the handling of German exports, but the arrangement had temporarily broken down because officials had been too busy with inter-zonal problems.

Water Softening Preparations

The Commissioners of Customs and Excise announce that soda types of water softening preparations with colouring or aromatic ingredients, *e.g.*, simple preparations of sodium sesquicarbonate, coloured or containing pine oil, pine compounds etc., are chargeable with Purchase Tax at the rate of 100 per cent of their wholesale value under Class 18 (i) whether or not they are sold as bath salts.

Paint Research Labs.

Anniversary Exhibition of Work

On Monday last, at the invitation of the president and council of the Paint Research Association, technical press representatives attended a preview of the exhibition of work at the association's laboratories at Waldegrove Road, Teddington, to mark the eve of special Twenty-First anniversary celebrations.

To do justice to the exhibition in the course of an afternoon, would be to accomplish the near-impossible. An entire day could be spent in the physics division alone, for there were many new scientific devices to see and to examine, and more than a few "old friends" such as the Redwood Viscometer, and the Ford Cup with which to become reacquainted. There were many new and old experimental methods for studying colour, durability, and the general physical properties of coating materials and compositions. Apparatus displayed included the electron microscope, spectrometers, and ultrasonic equipment.

Chemical Division

Of special interest was the chemical division where our representative witnessed a demonstration of the flame-retardance test, and the resistance of paints to heat. Other apparatus in the same room had application for micro-biological inflammability, film-forming, and degradation tests. In an adjoining room were exhibits illustrating certain aspects of the study of drying oil and of bitumens and bituminous compositions. A distillation column, autoxidation apparatus, and a device for low-temperature crystallisation were particularly interesting.

Of considerable importance to the paint industry at the present time is the question of producing an efficient, reliable, and comparatively inexpensive solvent. That there is plenty of scope for research and development in that direction was evident from the range of solvents displayed. Solvents, in common with linseed oil, are in short supply. Substitutes are being sought for the latter, while new and improved supplies of the former will be equally welcomed. A relatively new solvent, but one that has not so far proved attractive to the industry, is hydropentanone. Although highly efficient, its production costs are as yet too great to permit of its employment in any but the most essential of applications—and where costs are of no consequence.

Tribute must be paid to the obvious interest and enthusiasm shown by all the laboratory assistants and technicians, while there can be no doubt of the quality and value of the association's work.

OIL-RESISTING RUBBER

Swelling of Rubber and Interaction with Liquids

IN a memorandum by the British Rubber Development Board on oil-resisting rubber, the theory is put forward that for a given rubber the solvent or swelling powers of a range of liquids will depend upon their cohesive energy densities relative to that of the rubber. An "oil-resisting" rubber, it points out, is simply one of high cohesive energy density, while the poor petrol resistance of natural rubber is a result of its low C.E.D.

It is concluded that a rubber cannot be made oil-resisting by physical compounding, but that the chemical structures likely to give oil-resisting rubbers can be predicted with some confidence.

The Rubber Molecule

The memorandum begins by pointing out that a rubber molecule is long and chain-like, possessing a high degree of flexibility. Any selected short section of the molecule, it says, is surrounded by portions of other molecules (or another part of the same molecule). If liquid is present, one or more of the neighbours of the selected section may be a molecule of liquid. All these molecules are in constant motion, by virtue of their thermal energy, the motion becoming more violent as the temperature is raised. The motion is restricted by the existence of strong forces between the molecules: these have the effect of fixing the number of neighbours of the selected section and the average intermolecular spacing within fairly small limits. Within these limits the molecules vibrate; relatively infrequently they separate sufficiently to slide bodily over one another. In vulcanised rubbers a further limit to motion is imposed by the existence of chemical links at certain points, linking them into a more or less compact network.

A piece of vulcanised rubber, dropped into benzene, swells to several times its size, but retains its shape. With raw rubber a further stage ensues, in which the rubber flows and ultimately disperses. Inevitably one tends to form a picture of the rubber attracting and holding the liquid with some strong force. This picture is now believed to be entirely false and an alternative explanation of the phenomena of swelling and solution has been given.

Rubber, from the standpoint of solubility, is a liquid. This may seem surprising, but its mechanical properties make it clear that the rubber molecules have a good deal of freedom to slip past one another, which is just the characteristic that is associated with the liquid state. This, of course, is not a complete description of rubber, but it represents the factor which is important for the present résumé. The absorption of oil by rubber is thus to be regarded as the mixing of two liquids—rubber and oil. The problem to be solved was whether these liquids mix because of their thermal motion or whether there is really some force of attraction between the rubber and the oil.

It is necessary first to consider briefly the way in which simpler materials mix with one another. In a gas the molecules spend most of their time a long way from one another, and the total energy of the system is therefore made up largely of the kinetic energy of thermal motion, in consequence of which the gas molecules tend, on the average, to distribute themselves uniformly, so that any pair of gases mix completely.

In considering the mixing of two liquids another factor becomes important. The molecules of a liquid are close together and therefore exert strong forces on one another. These are measured by the cohesive energy density (C.E.D.), equal to the latent heat of evaporation per c.c. As different liquids do not have the same C.E.D.s it must be concluded that their molecules cohere with different energies. This difference depends partly upon the chemical nature of the molecules and partly on the way they pack together.

Change of Intermolecular Forces

Mixing two liquids involves changes in those intermolecular forces by bringing unlike molecules close together, and these are reflected in the absorption or evolution of heat. It has proved extremely difficult to calculate the magnitude of these changes, but for many types of liquids it is found that the controlling factor is the difference between the C.E.D.s of the two liquids. If these are equal, the liquids mix athermally, the more they differ the larger the *absorption* of heat. This theory thus provides no explanation of exothermal mixing, which is indeed generally to be regarded as evidence of some form of association between the liquids.

This absorption of heat opposes the natural thermal mixing of liquids, and if it becomes large enough leads to separation into two phases.

It will be seen that the sign of the heat change involved in mixing offers very direct evidence as to whether mixing is due primarily to thermal energy or to specific attractive forces. It is not easy to apply this method directly to rubber-liquid systems owing to the difficulties of calorimetric work with rubber. The heat of mixing rubber with a liquid can be calculated from accurate measurements over a range of temperatures of the vapour pressure of the liquid above mixtures of rubber and liquid. This method has the additional advantage that it enables a quantitative estimate to be made of the thermal mixing tendency, in terms of the thermodynamic function called the entropy. This method has been applied very carefully to the system natural rubber + benzene and shows unambiguously that:—

(a) The thermal mixing tendency (entropy of mixing) is very large;

(b) heat is *absorbed.*

Thus the picture of rubber offering a strong attraction to the oil is completely wrong. Any such attraction would mean that the increase of energy would be negative, and it is found to be positive. Secondly, that the true explanation of the imbibition of oil by rubber is the same phenomenon as underlies the mixing of simple gases and liquids, namely, an increase in entropy brought about by the natural tendency of molecules to mix by thermal motion. The fact that swelling is observed has nothing to do with any attractive forces between rubber and oil; it is rather a visual indication of the extent to which the rubber molecules themselves cohere—only high molecular raw rubber shows either elastic retraction, or swelling, as a prelude to dissolution.

Semi-Quantitative Theory

This way of considering the swelling and solution of rubber has been extended into a semi-quantitative theory. There are reasons for believing that the enthropy of mixing will be nearly independent of the chemical nature of both rubber and liquid, while vulcanisation will introduce a modification which can be calculated from the modulus of elasticity of the vulcanisate. Thus for a given rubber, the solvent or swelling powers of a range of liquids will depend upon their cohesive energy densities relative to that of the rubber. If a series of liquids be selected whose C.E.D.s cover a sufficiently wide range, it should be found that the best swelling agents lie at that point of the range where the C.E.D. is approximately equal to that of the rubber. Rubbers differ in C.E.D., depending on their chemical constitution, and on these differences depends their differing solvent resistance. An " oil-resisting " rubber is simply one of high C.E.D., while the poor petrol resistance of natural rubber is a result of its low C.E.D. It is interesting to note that the order of resistance to acetone is reversed.

The cohesive energy density of rubber is unaffected by compounding. The absolute swelling of a rubber in a good swelling agent is reduced by a reinforcing filler. As no comparable reduction occurs for a bad swelling agent, it appears likely that the effect of the filler is to link the rubber chains together so as to restrict their maximum distension.' It is consistent with this view that no comparable effect is found with non-reinforcing fillers.

The only way to change the C.E.D. of natural rubber is by chemical modification, and approximate rules can be drawn up showing the effect of different types of chemical grouping. Thus in principle it would be possible to predict roughly the type of structure needed to produce resistance to a given liquid.

The present theory, the memorandum points out, affords no explanation for the greater swelling power of aromatic liquids compared with aliphatic, but the main factors governing the absorption of liquids by rubber have been outlined, and it is shown how the swelling of a given rubber in a given liquid may be roughly predicted if the cohesive energy density of the liquid is known. A complete quantitative theory is not in sight, but certain conclusions of practical importance emerge: first, a rubber cannot be made oil-resisting by physical compounding; and, secondly, the chemical structures likely to give oil-resisting rubbers can be predicted with some confidence.

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Gas Plant Fire

ON September 17, a wide area of the Ellesmere Port district was shaken by an explosion in the engine room of the Edeleanu gas plant of Lobitos Oilfields. Mr. H. E. Digby-Roberts, plant superintendent, and Mr. A. M. Pillings, chief operator, who received burns and cuts on the hands and head, were saved from more serious injuries by gas masks which are customarily worn in the engine room. The resulting fire was quickly got under control and extinguished. The first fire-fighting appliances to arrive were from Shell's Refineries, followed soon afterwards by the N.F.S. from Ellesmere Port and Port Sunlight. The Lobitos installations, which are themselves extensive, are only one of a number of other refineries and oil tank farms in the same area which together comprise one of the biggest oil centres in the North of England. All permitted fires in the area, such as those in canteen kitchens, were extinguished to minimise the danger.

GLASS IN THE LABORATORY—VI

Cutting Glass Tubing

by I. C. P. SMITH, B.Sc., F.R.I.C.

In the previous article on cutting glass tubing, the use of the knife was fairly fully described, as well as the aids for producing good cuts from the initial knife mark. The present article collects some of the alternative and mechanical methods, usually confined to works, owing to the high initial outlay.

Diamond Cutters

As the diamond can form one of the cleanest and surest methods of cutting glass tubing, particularly the hard glasses, it is worthy of detailed study. Fig. 1 represents diagrammatically the placing of a diamond on a glass surface at the cutting angle. It is important to note that the cutting part of the diamond occurs actually on the short curved ridges adjacent to the more oblique intersecting angles, there being eight such ridges on each diamond.

When cutting, the curve must rest tangentially on the glass, and the diamond moves to the right. If the diamond has tilted to the left, it digs and forms a white mark which will not form a cut; if to the right it will make a more indefinite mark but also not a cut. A glazier's diamond is set so that the sloping lower end of the holder is approximately parallel to the glass surface; the diamond is drawn towards the operator, who becomes practised in holding it at the correct angle and moving at the optimum speed of some 3 ft. per second.

The production of a true cut is accompanied by a slight vibration, perceptible in the fingers, and a clear note. The cut can be seen immediately by the reflection of light from its sides, and is quite different from the white scratch produced by a diamond held at the wrong angle.

Curved Surfaces

The diamond is sometimes applied to cutting on the outside of tubing or of beakers, necks of flasks, etc., in production, but it is best suited for the cutting of tubing internally, as this face is usually in tension, while the outside is in compression.

For this purpose the diamond is mounted near the end of a steel rod to cut transversely; the rod is inserted in the tubing to the required length and the cut formed by a rolling action. To assist the operator in finding the cutting angle, marks are made on the steel rod opposite the diamond, so that when they are on top the diamond is correctly pointed downwards.

On the round surface of the tube, however, the diamond must be kept at the bottom of the curve, otherwise, when it rides up the curve on either side, the angle of contact becomes incorrect.

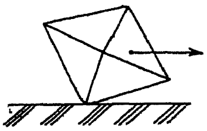
Using the hand diamond cutter is therefore a matter of practice but once the knack is acquired the tool is quite reliable. It is best used as in Fig. 2 with the end of the tube against the loose washer, provided the latter is being run against the edge of the bench. The tube is rolled towards the operator by the flat of the left hand, while the right hand draws the diamond along at the same speed as the tube (half the speed of the left hand). This is simpler in practice than it is to describe. It is important that one turn only is given to the tube, as the diamond must not be allowed to run over a cut twice.

Mechanical Aid

Fig. 3 is a machine devised for cutting out most of the difficulties in using the diamond. This has two equal and parallel rollers on which the glass tube may be rotated, and the diamond rod is pivoted so that it moves in a plane forming the right-angle bisector of the line between the axes of the two rollers.

This ensures that once the diamond has been set at the cutting angle by carefully rotating its rod and locking it in its holder, the diamond will always meet the bottom of the bore of the tube. A spring is provided to lift the diamond slightly when not being used.

Fig. 1.



In use the diamond is brought down on to the glass surface by gentle pressure of the tips of the fingers of the right hand, the base of the hand being steadied on the board, while the tube is given one turn by drawing the left hand over the top.

So much for the general use of the diamond; it only proves its value and gives long service if some precautions are taken. These are, however, very well worth mastering.

First, the diamond itself: if soda glass only is to be used, then an A or a B quality will suffice, but if the work is with hard glasses, a Star A diamond should be employed. This has a very much longer cutting life than the cheaper diamonds: it can be reset by the makers a number of times and, moreover, it carries much greater prestige with these artists, who will consequently give very much better care and attention to the tool.

Second, one should study the actions of a glazier in using the diamond. He carefully gets the feel of the cut then draws the tool towards him with an even, firm pressure, and at an even speed.

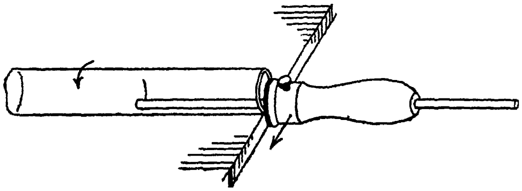


Fig. 2.

In Fig. 2 the diamond is drawn along the bench at this same speed, while the left hand is drawn back at double the speed. In Fig. 3 the left hand is drawn back at the cutting speed, imparting the same relative speed and direction to the cutting edge, independently of the diameter of the tubing. (Theoretically there is a small correction for wall-thickness.) To apply the necessary pressure with the hand-held diamond, a bending action is applied to the handle, the thumb pressing down. In the machine, however, the rod is gripped between the tip of the thumb and upper joints of the first and second fingers, the base of the hand resting on the board. This grip steadies the diamond on the glass, at the same time exerting a steady pressure.

When the diamond is used to cut soda glass a light pressure is all that is required, as the internal wall is usually in a state of tension, and the crack opens up naturally; in the case of hard glass, however, this state of tension though present, is usually only slight, and because the glass is of a physically harder nature, a greater pressure is required. The cut usually forms more easily if the region is first wetted, and if the cut does not immediately travel through, then the outside of the glass should be heated round the region of the cut by a quick spin round in a small gas and air blow-pipe flame.

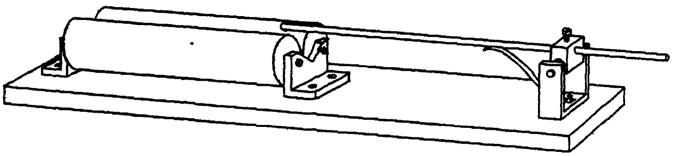


Fig. 3.

Using the diamond, practice is required in obtaining the feel of a true cut, and recognising the appearance of the reflection on the somewhat corrugated walls; and if a diamond is well used in careful hands it will make thousands of cuts on hard glass tubing.

It is well therefore to observe the following don'ts:

Don't run the diamond over the same cut twice. Don't lend your diamond. Don't touch the inside surface of a tube with the rod, and don't touch the diamond point anywhere except when cutting. Don't hit the diamond on the head when it is blunt in order to obtain a fresh cutting edge, send it back to the setter. Don't try to be too ambitious at first; start on soda glass of about 1 in. to 1¼ in. diameter, then on hard glass. With practice one can cut up to 6 in. on the machine with a clean quick cut.

Hot Wire Cutting

The hot wire is a length of resistance wire, usually nichrome, of 22 to 18 s.w.g., and brought to a state of redness by means of a low voltage, high amperage current.

One arrangement when A.C. is available is a simple transformer with tappings to give 4 volts or 12 volts at 18 amps., with 6 in. and 18 in. lengths of 18 s.w.g. wire across the terminals respectively. Brass pillars are employed for the terminals.

A small Variac transformer is excellent for this purpose; any selected length of resistance wire can be first wrapped round the tube, and the current turned on until the required redness is produced and a crack formed.

For soda glass a cut with a knife is not required. For cutting small diameter tubes, particularly short lengths, such as Raschig rings which are difficult to hold, the tube is rolled on a short stretched length of the hot wire, and a stop is employed to maintain even length. The longer wire is particularly valuable for cutting the hard glasses. A cut having been made with a knife, the wire is wrapped round the tube over the cut, current switched on, and after about half a minute removed, the tube touched with a wet cloth and a clean crack runs round the tube.

To assist this: 1, the wire may be in a

ready formed loop between the terminals, and pulled tight round the glass. 2, The wire may be fixed in the one terminal only, having a wooden handle (like a cheese wire) at the other end; the wire is wrapped round the tube and hooked under the quick action second terminal. 3, The wire may run between the ends of wooden tongs. It should be remarked that the wire is running at low voltage and may be handled with impunity.

Other Methods

The diamond and the hot-wire methods of cutting glass tubing and rod find their way into the laboratory; the following methods which are employed commercially might however be briefly described here.

The carborundum cutting or slicing wheel is illustrated in Fig. 4 and consists of a rubber bonded carborundum wheel about 10 in to 12 in. dia. and 1/16 in. thick, carefully mounted to run at a high speed. The tube or rod, backed by a wooden holder, is brought against the wheel by hand pressure, while water jets spray about the cutting region. The action is to cut and fine grind the two ends at the same time. It will cut through a normal 2 in. tube in 2 to 5 seconds and make a clean cut through a bottle or heavy rod.

The steel cutting wheel is a 12 in. tool-steel disc, about ⅛ in. thick brought down to less than 1/64 in. at the edge, and sharpened. It rotates at about 2880 r.p.m. and requires a ½ h.p. motor. Smaller wheels are sometimes employed in mechanical setups.

The wheel is usually mounted under the bench, with just a small segment appearing above the surface. This is mainly protected by a metal cover, with a hinged piece covering the small part which will be used. The tube to be cut is rotated against the wheel, when by friction the glass is actually melted out in the form of a groove. A crack may be started but the line of weakness generally allows the tube to be pulled apart at the cut. This method suffers from leaving a somewhat dirty end, which should not be incorporated in a join.

There is the appearance of a "flame" at the point of contact of the wheel and the tube, and glass is melted away; the shredded fragments usually have the appearance of green bottle glass due to contamination by the iron of the wheel. The cleanest cut is obtained by rotating the glass tube against, not with, the turning of the wheel.

Use of Flame

A method of cutting soda or lead glass, which is in vogue in places such as lamp or radio valve works which handle very large quantities of tubing, is one in which the tube is rotated against a ring of tiny high-temperature flames; it is then immediately rotated against a cold wheel; the latter may be either a steel or a welded carborundum wheel, which also rotates with the glass, so that there is no rubbing action on the glass which might mar the surface. By this means a clean crack off is produced.

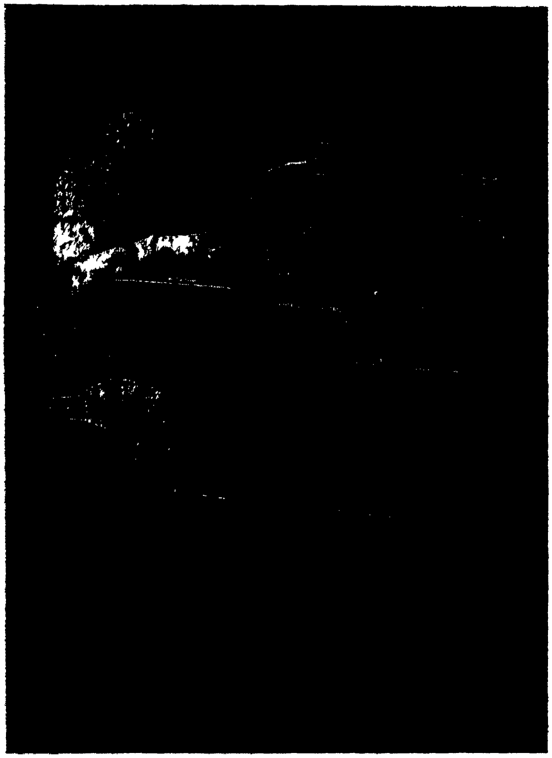


Fig. 4. Carborundum slicing wheel.

(by courtesy of Messrs. J. Martin & Son, 14, Jenkins Street, S.E.1)

This method is applied in multiple machines, cutting a dozen or two dozen small tubes at a time; it is also applied to trimming the ends of tubes of 1½ in. dia.; but in this case the tube, having been heated, rolls over a cold steel surface to produce the crack. The uneven end falls off, while the tube proceeds to the next stage.

INSTITUTION OF CHEMICAL ENGINEERS

Successful Manchester Course

A COURSE in chemical engineering design held at the University of Manchester on September 15-17 by the Institution of Chemical Engineers, North-Western Branch, was attended by about 120 chemical engineers.

Professor Graham Cannon, pro-vice-chancellor of the university, who was introduced by the vice-chairman of the branch, Mr. J. McKillop, opened the course and welcomed the delegates. He spoke of the transfer of chemical processes from the small to the large scale and, as many of the processes were instituted in the laboratories of a university, it was fitting that the institution had decided to hold a course in chemical engineering in a university.

The principles of chemical engineering design were illustrated by notes on "The Production of Ortho and Para Mono-Nitro-Toluene from Toluene."' The notes were presented and explained by: M. B. Donald, M.Sc.; C. H. Bowden, B.Sc.; J. M. Coulson, M.A., Ph.D.; F. Rumford, B.Sc., Ph.D.; F. E. Warner, B.Sc.

Problem Conditions

In his introduction of the problem, Mr. Donald gave the conditions to which the problem conformed, *i.e.*, that the data regarding it should be easily available in the scientific literature, that the reaction should be practically instantaneous and that no special experience was necessary in order to solve the problem. The problem was not posed with the object of producing the product in a commercial form at the lowest cost, it was not a commercial solution to the problem of the manufacture of mono-nitro-toluenes, in fact several pieces of plant had been included with the object of illustrating the principles of their design. The object of the research is to prepare a compound and the chemical engineer has to decide on one of a number of methods of preparation of the compound; some of the methods available to the chemist may present insuperable difficulties to the chemical engineer, therefore Mr. Donald recommended that the research chemist should have some knowledge of chemical engineering principles.

The notes included the preparation of the flow sheets, the physical design of the plant, the plant schedule, the materials of construction, the plan of operation, safety measures, and instrumentation. These items were discussed and the lecturers also gave informal talks on the general principles underlying some subjects, *e.g.*, heat transmission and instrumentation in chemical plants.

BETTER TELEPHONE FACILITIES

Bouverie House Development

A NEW private branch exchange has been installed at Bouverie House, Fleet Street, London, head office of Benn Brothers, Ltd., publishers of THE CHEMICAL AGE, and other journals.

The new installation, which provides sixteen exchange lines, five external private lines, and a hundred internal extensions, will give greatly enhanced accessibility to the advertising and editorial services of the organisation. Officially designated as "Section Switch P.M.B.X. No. 1A," the new equipment has three operating positions, separate apparatus racks, and a power plant.

Apart from THE CHEMICAL AGE, the other journals of the Benn group which will benefit from the new telephone exchange include the *British Trade Journal, Cabinet Maker, Electrician, Fruit Grower, Gas World, Hardware Trade Journal, Industria Britanica, Leather Trades Review, Miller, Newspaper World, Nursery World, Textil,* and *Timber Trades Journal.*

The Importance of Research

ADDRESSING the 48th annual general meeting of the Calico Printers' Association, Ltd., last week, Mr. R. M. Lee, chairman, said that the Association had long been convinced of the importance of research, and despite the difficulties involved in obtaining the services of trained scientific personnel, it was intended to pursue a policy of expansion and development in that direction. While trade research organisations would be supported, the Calico Printers were firmly of the opinion that the best results could be achieved only by energetic research by individual firms.

As an instance of successful individual research, Mr. Lee drew attention to the Association's new artificial fibre "Terylene," at present being developed by I.C.I. for which he forecast a not insignificant future.

(*Continued from previous column*)

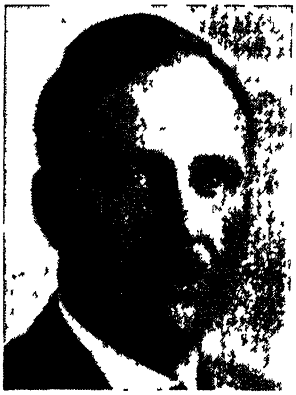
The course was an undoubted educational and social success, thanks to the lecturers and the University of Manchester which generously placed accommodation and equipment at the disposal of the North-Western Branch.

It is hoped that the notes on the problem will be made available later at approximately one guinea per copy by the Institution of Chemical Engineers, 56 Victoria Street, Westminster, London, S.W.1.

U.S. CHEMICAL CONGRESS

DR. L. H. LAMPITT DESCRIBES BRITISH CHEMISTS' DIFFICULTIES

ELEVEN thousand chemists and chemical engineers from all parts of the United States and several foreign countries were in New York last week for the 112th national meeting of the American Chemical Society. It was the largest gathering in the history of the chemical profession, and because of this, meetings had to be allocated to some of the city's leading hotels in addition to those held at the Engineering Societies Building, 29 West 39th Street, N.Y.



Prof. W. A. Noyes

Dr. L. H. Lampitt

The principal British representative was Dr. Leslie H. Lampitt, president of the Society of Chemical Industry, who spoke on " totalitarian planning " at a joint meeting of the Society's American and Canadian Sections and the New York Section of the American Chemical Society, and later spoke at a luncheon of the Agricultural and Food Division.

When the congress ended last week-end nearly 1000 technical papers had been presented at sessions of the Society's eighteen professional divisions, according to Professor W. Albert Noyes, Jr., president of the Society and head of the department of chemistry in the University of Rochester, N.Y.

Recent research on rocket and jet fuels and progress in nuclear and radiation chemistry and many other fields, including plastics, synthetic rubber, and textiles, were reported. Reports were also made on the manufacture of synthetic gasoline and oil from coal and natural gas, and on developments in the production and refining of petroleum.

At a general meeting of the Society held in Manhattan Centre last week, seven outstanding scientists were honoured. The Priestley Medal, highest award in American chemistry, was conferred upon Professor Warren K. Lewis, of the Massachusetts Institute of Technology, for distinguished services to chemistry. Professor Lewis spoke on " The Kinetics of the Reactions of Steam and Carbon Dioxide with Carbon."

At the same meeting, Professor Glenn T. Seaborg, of the University of California, co-discoverer of plutonium, and a member of the general advisory committee of the United States Atomic Energy Commission, received the $1000 American Chemical Society Award in Pure Chemistry, given by Alpha Chi Sigma, national chemical fraternity, for his achievements in nuclear science. Professor Seaborg delivered an address on " Nuclear Transformations in the New High Energy Ranges."

Others who received awards at this meeting were . Professor Mary L. Sherrill, head of the department of chemistry, Mount Holyoke College, to whom went the Francis P. Garvan Medal for women chemists; Professor Van R. Potter, of the McArdle Memorial Laboratory for Cancer Research, University of Wisconsin Medical School, recipient of the Paul-Lewis Laboratories Award in Enzyme Chemistry; Dr. George C. Supplee, head of the G. C. Supplee Research Corporation, Bainbridge, N.Y., who received the Borden Award in the Chemistry of Milk; Dr. Sidney P. Colowick, of the Public Health Research Institute of the City of New York, given the Eli Lilly & Company

Award in Biological Chemistry; and Dr. Louis Schmerling, of the Universal Oil Products Company, Chicago, Illinois, who was awarded the new $3000 Ipatieff Prize for achievements in the field of catalysis.

Totalitarian Planning

Speaking before a joint gathering of American and Canadian chemists, Dr. Leslie H. Lampitt said that totalitarian planning will not solve the British economic crisis. Declaring that one of the major obstacles to revival of competitive production by Great Britain is the obsolescence of her machinery and technological processes, and that under present conditions of economic austerity it is difficult to see how modernisation can be accomplished, Dr. Lampitt said: "In capitalistic as well as in govermental circles this is well recognised, but we cannot all agree that totalitarian planning will lead to the desired solution."

The inadequacy of such planning, he said, was demonstrated by Germany in the food industry where, despite the vaunted efficiency of German plans, the Germans "rather lagged behind than led in the race for supremacy." In the field of science and technology, he doubted whether the Labour Government could carry out the Prime Minister's promise to speed up the practical adaptation of laboratory discoveries. "He is not the only minister who has spoken this way and one has felt the suggestion that in the past there has been some malevolent force at work which has prevented that speedy application of new knowledge," Dr. Lampitt said.

"I do not subscribe to the idea that you can run before you can walk. Many people on this side have suggested to me that that is what we are trying to do in England to-day. It is said that we are witnessing schemes being put on the production lines straight from test-tube experiments, and that no tests on a pilot plant have been conducted. Those of us who have been concerned with the application of laboratory work to industry know the usual fate of processes which are put into application without thorough test."

Directed Research

He particularly deplored a growing trend in England toward directed, or "planned," research undertaken with a definite practical objective. Asserting that the innate curiosity of man to explore the unknown should remain the mainspring of investigation, he pointed out that penicillin, synthetic vitamins, the preparation of hormones, and even the splitting of the atom were the result of curiosity rather than of research conducted toward a practical end.

The spirit of inventiveness and investigation that marked the enormous contributions of British scientists to victory in World War II still exists, Dr. Lampitt asserted, adding: "You remember, possibly, a sentence in one of Mr. Churchill's stirring speeches concerned with the fighting on the beaches, etc. —that spirit is still evident in 1947."

There was, however, an all-pervading feeling of frustration because of the lack of materials. In education, he noted, although no other government has been so lavish in its allocation of money to training establishments, construction of buildings and apparatus was held up by shortages of materials and manpower.

In view of the new food-rationing orders and other restrictive regulations, he said, "it would appear that the sub-normally fed scientists would again have to work short hours in order to conserve both light and heat, and will have to spend valuable hours in their badly lighted and insufficienty heated homes." Exchange of scientific information in England was greatly hampered by the paper shortage which delayed and sometimes prevented publication of important reports.

One of the most evident results of the war was that Britain had had "by far the worst end of the stick." Whether our present doctrinaire leaders are best fitted in their experience of affairs, both internal and external, to deal with the crisis is a matter of opinion," he said.

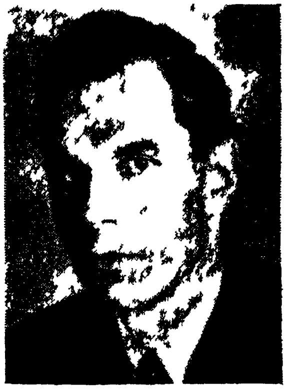
Natural Products

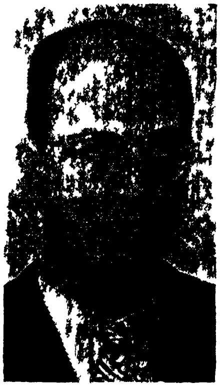
One development in British science which Dr. Lampitt emphasised was the increased attention being given to natural products by organic and physical chemists. This is a change of far-reaching importance, he said, predicting that the study of biological and physiological processes with the attendant advantage to mankind will proceed with ever-increasing impetus. Concluding, he said he doubted that peace would ever come to the world as long as materialism holds sway, and he called upon American contemporaries to denounce materialism and dedicate themselves "to the betterment of the world, with the recognition that only as we observe religious and moral precepts shall we achieve our worthy object."

Among the many technical papers of contemporary importance was a study of synthetic production of liquid fuels contributed by Dr. A. R. Powell, associate director of research of the Koppers Company, Pittsburg. Current demand for such fuels far exceeded demand in the years immediately preceding the world war, he said, and would continue to increase. The search for inexpensive synthetic substitutes from coal, natural gas, and other materials was being pushed aggressively and he predicted that low-cost synthetic petrol and oil would be manufactured on a large scale in America within the next decade.

Prof W. K. Lewis (left)

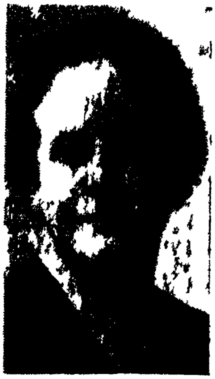
Prof. G. T. Seaborg (right)





PERSONALITIES OF U.S. CHEMICAL CONGRESS

Some of the 11,000 chemists who took part in the U.S. Chemical Congress in New York last week are featured on this page Professors Lewis and Seaborg (above) and Dr. L. Schmerling (left) and Professor Mary Sherrill (right) were all honoured by the Society. Drs. Egloff and Powell (below) contributed important papers to the Congress.



Dr. H. R. Powell (right)

Dr. G. Egloff (left)

LETTER TO EDITOR

River Pollution

DEAR SIR,—I have read the article entitled "River Pollution" (Effects of Chemical Works on Fisheries) in THE CHEMICAL AGE dated September 13, 1947. It is interesting, but to me was inaccurate in one respect. It is common knowledge in the whole of this area that few, if any, salmon have been found in the Tees since June, 1932, because of the evil effects of pollution in the river. It may be that the remark to the effect that 1600 salmon are found in the Tees yearly refers to a period of time considerably *before* June, 1932. If this is so, should it not have been stressed in the article?

I would, however, esteem it a favour if you would kindly inquire of the author as to how he arrives at the figure 1600, *i.e.*, in the context:—

"The Tees *now yields* about 1600 salmon a year compared with its little neighbour the Esk," etc., for it seems to me this number is excessively high.—Yours faithfully,

(Sd.) ROBERT H. CLAPHAM.

6 Reeth Road,
Middlesbrough.

Our correspondent writes:—

I have a note in a list of salmon reports that in 1934 the Tees mouth returned 1648 salmon from the nets and 1083 migratory trout, making a total of 25,386 lb. Compared with this the Esk produced 3093 salmon and 3896 trout weighing 49,611 lb. I visited the Tees valley and Tees mouth on several occasions in 1943 and 1944, when I was at Darlington. Admittedly the preponderance of net-caught salmon and the paucity of rod-caught fish shows how few got up the river. In 1927 I have a note that the Tees produced 3892 net salmon and 119 rod salmon, total weight 3246 lb. At the Tees Fishery Board meeting at Darlington, September 25, 1944, a recommendation of the Standing Committee was adopted that a report be made on what steps could be taken to restore the river to its former status as a salmon river.

Danish Trade Mission

Talks were held in London on Tuesday and Wednesday last between members of a Danish Trade Mission and representatives of the Federation of British Industries. Chemical and steel interests were represented by Mr. J. Davidson Pratt (A.B.C.M.) and Mr. R. C. Smith (B.I. & S.F.).

The purpose of the meeting was to review economic conditions in Britain and Denmark, and to discuss practical problems facing trade between the two countries.

SCOTTISH RIVER POLLUTION

RIVER authorities, sanitary officers, and public health officials, in Scotland are pressing for a survey of river and coast pollution in Scotland. For many years periodic disputes regarding industrial effluent and its effect on Scottish rivers have disturbed county authorities and industrial concerns, but even now a considerable degree of uncertainty exists as to individual rights and responsibilities.

There is also an increasing feeling in Scotland that major progress is overdue in sanitation methods in many areas, and that valuable by-products are now being wasted. The Ayr County Chief Sanitary Inspector has issued a report condemning the pollution of Ayrshire rivers and coast lines resulting from unenterprising sewage disposal.

Abuse of many such areas and the continuing use of crude sewage systems has also been commented on, with an appeal that modern sewage works be initiated, which could provide valuable income from fertilisers and other by-products.

Action is being taken by Glasgow Corporation to eliminate the alkali scum which at present covers the River Kelvin, and which was the subject of a recent reproach in a Scottish broadcast. This scum, the Lord Provost has indicated, comes from a paper mill outside the city boundaries, and the only method of eliminating the scum is to stop manufacturing paper. The Corporation of Glasgow is now working on an experiment to erect scum boards or screens. Four traps of this nature are planned for the main city area and one has already been installed. The alkali will be trapped, diverted to a side recess and dissipated by water jets.

World Fibre Shortage

According to the World Fibre Survey drawn up by the Food and Agriculuture Organisation of the United Nations, world production of the five major household fibres—cotton, flax, hemp, silk, and rayon —in 1946-47 was 24 per cent below the 1934-38 average. In 1947-48, the Survey asserts, production will be a little higher, but still considerably less than before the war. The situation is attributed to man-power shortages, and lack of fuel, power, and chemicals.

Minerals Industry.—A meeting of the American Institute of Mining and Metallurgical Engineers will be held in Denver, September 28 to October 3, 1947 to discuss current and future developments in the mineral industry. It will embrace the manifold problems of the petroleum industry as well as mining and concentration of ores and will indicate future trends.

Home News Items

Patent Fuel Manufacture.—The Minister of Labour has published special regulations (Form 1032) relating to patent fuel manufacture. This form can be obtained from H.M. Stationery Office, price 3d.

Exhibition Extension.—In view of the success and continued popularity of "Enterprise Scotland" exhibition, its organisers have decided to extend it beyond the original closing date of September 30. It will now remain open at least until the middle of October.

Ellesmere Port Fire.—Called to a fire which broke out at the British Aromatic Company's works in Cromwell Road, Ellesmere Port, on September 20, the N.F.S. had to wear breathing apparatus owing to the poisonous fumes given off by cyanide residue which had become ignited through contact with a gas ring.

Penicillin Exports Cut.—U.K. exports of penicillin are to be reduced to help supply the continuing unsatisfied home demand. The Ministry of Supply, announcing the decision this week, states that present exports represent approximately 40 per cent of production and are temporarily to be reduced immediately to 30 per cent of production—which is increasing rapidly.

Winter Coal Prospects.—Industrial undertakings are to be notified by November 1 the amount of fuel they may " reasonably expect " to receive during the winter. Mr. Hugh Gaitskell, Parliamentary Secretary, Ministry of Fuel, announcing this last week, said that peak output would be called for from electricity undertakings and there would be no shedding of loads " unless circumstances were wholly exceptional."

New Glassworks in Falkirk.—Falkirk is to have a new glasswork industry in the near future, according to Provost Peter Simon, of Falkirk. As a centre of the light castings industry, Falkirk has also coal deposits adjoining and a considerable labour potential for lighter industries. No details are yet available as to the interests involved or the particular type of glassware which will be produced.

I.C.I. Factory's Role.—The former explosives factory at Powfoot, Dumfriesshire, is being converted by I.C.I. for the production of pentaerythritol, a wartime high explosive now used extensively in the paint industry, replacing to a large extent glycerine and other scarce ingredients. This is one of several conversions which have been carried out in Scotland by I.C.I., under the policy of re-adapting wartime plants and products to peacetime purposes.

Monsanto Golf Tournament.—Members of the Monsanto Golfing Society recently held a tournament at Brookman's Park Golf Club. The four-ball bogey competition was won by F. S. Mortimer and G. Dodd, while the match between the captain's and the secretary's teams was drawn.

Brown (Off-the-Ration) Coal.—Small consignments of brown coal, mined in Devon primarily for the production of wax and resin by-products, are shortly to be despatched to Manchester, where it will be given a trial as an off-the-ration fuel. It is understood that owing to high carriage expenses it will be sold at about £5 a ton.

Zirconal Ltd.—Zirconal Ltd., formed in conjunction with Silicon (Organic) Developments Ltd., 11 Cavendish Place, London, W.1, is to maufacture synthetic mullite and zircon refractory compounds, using the Silester bonding process. The firm is equipped to make semi-permanent moulds and dies, crucibles, furnace equipment, electrical and similar components.

Falling Coal Figures.—Total production of saleable coal in the week ended September 6 was 3,620,700 tons (against 3,784,800 a year before) and the provisional figure for the following week showed a further reduction to 3,581,000 tons. Tonnage lost through disputes, holidays and transport difficulties totalled in the latter week 317,200 tons, compared with 69,800 tons in the corresponding week in 1946.

Heatherwood Production.—It is understood that the Scottish Co-operative Wholesale Society anticipates the production of heatherwood—a resin bonded synthetic hardwood, constructed from the denuded roots of aged heather, compressed under power and cut from the solid into veneers —in early December. This is the process which the Co-operative Society secured from the Dutch patentee and which they anticipate will allow a maximum adoption of the material for a wide variety of purposes.

Coke-Oven Agreement.—Under an agreement made between Simon-Carves Ltd., of Cheadle Heath, Stockport, and the Otto-Wilputte Oven Construction Co., of Holland, the two companies will collaborate in technical work on coke-oven construction. They are to co-operate in big coke-oven contracts in Europe and territories outside Britain and the Empire. The name of the Dutch company has been changed to Otto-Simon-Carves N.V., and Mr. D T Barritt, a director of Simon-Carves Ltd., and the head of their coke oven and coal washery business, has been appointed to the board.

Personal

MR. G. R. FISHER has been appointed a director of the Zinc Corporation.

MR. W. D. WHEELER has resigned his directorship of Rhodesia Broken Hill Development. His successor on the board is MR H. F. OPPENHEIMER.

MR. D. J. CARLISLE, director/secretary of James H. Dennis & Co., chemical manufacturers, is to retire next week. He is to be succeeded by MR. HERBERT HUTCHINSON.

MR. H. G. TAYLOR has been appointed Director of Research of the British Welding Research Association in succession to MR. A. RAMSAY MOON.

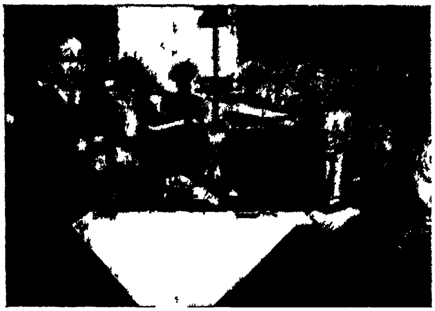
DR. KURT HELLER, a physical chemist at the former German University of Prague, died recently in Berne, Switzerland, at the age of 49.

LORD MELCHETT, who resigned his directorship of I.C.I. in July of this year owing to ill-health, is at present recuperating at Culworth, Northants, following a recent operation.

MR. ROBERT HENDRY, B.Sc., of Bathgate, has been appointed senior lecturer in Chemical Engineering at the Royal Technical College, Glasgow, where he will commence duties in January. Mr. Hendry is a graduate of Glasgow University.

MR. G. P. HOFF, formerly director of the acetate research section of E.I. Du Pont de Nemours & Co., has been appointed assistant manager of the technical division of the rayon department, Wilmington, Del., U.S.

MR. GEORGE WOOD, deputy chairman and joint managing director of Thomas W. Ward, Ltd., has been presented with a gold wrist watch by the staff of that company to commemorate his 50-year period of service. The presentation was performed by Mr. F. A. Shirt, the firm's oldest employee.



From left to right: Mr. F. R. Stagg, Mr. F. A. Shirt and Mr. George Wood

GEN. SIR RONALD ADAM, former Adjutant-General, has been appointed chairman of the National Institute of Industrial Psychology.

DR. PER K. FROLICH, a member of the American Section of the Society of Chemical Industry, has been appointed director of research and development of Merck & Co., Inc., N.J., in succession to DR. RANDOLPH T. MAJOR, who is now vice-president and scientific director of the firm.

MR. H. THOMPSON, who has been appointed managing director of British Tanners, Ltd., had been manager of the company since March of this year. MR. ERNEST HEWITT, secretary to the company since 1919 (the date of its inception) has also became a director.

LORD LEVERHULME, who was accompanied by Mr. G. A. S. Nairn, chairman of Lever Bros., Port Sunlight, and other directors, on September 20 laid a wreath on the tomb of his father, the first Lord Leverhulme, at Christ Church, Port Sunlight. The ceremony was in commemoration of Founders' Day.

CAPTAIN C. F. TURNER, F.R.I.C., the assistant city analyst, Liverpool, has retired after nearly 35 years' public service. After working in the Lancashire County Laboratory, Captain Turner joined the staff of the newly-appointed city analyst in 1912, when the city first had its own analytical department. During the 1914-18 war he served in France and, on returning, took the examination, in food and drugs, of the Royal Institute of Chemistry. For many years he was an inspector in the Special Constabulary, but during the last war he resigned to become a Gas Identification Officer, feeling he could thus do work of greater value, and during the greater part of the war he ran this service in the city.

DR. W. D. SCOTT, chief chemist of Monsanto Chemicals, Ltd., and DR. J. W. BARRETT, the same company's exploratory research superintendent, left for America yesterday to study the research activities of the Monsanto Chemical Company in the U.S.A. where they will visit eight of the thirty-two American Monsanto plants, including the Dayton Central Research Division. The purpose of the visit is to integrate the research activities of the British and American companies during the next five years, an objective which will be facilitated by the early completion of new £100,000 research facilities at Ruabon, North Wales. Dr. Scott and Dr. Barrett will also make a general survey of the many new products and processes now being developed by Monsanto in America to determine whether there are any likely to be of value to British chemical economy.

Overseas News Items

Colombian Petroleum.—The output of petroleum in Colombia in January-June, 1947, was recorded at 12,253,000 barrels, against 11,718,000 barrels in the first half of 1946.

Copper Mining in Czechoslovakia.—Propping and safety work is soon to begin in the old copper mines near Krompach. The copper ore from the vein in the neighbourhood of this town produces some of the best Czechoslovakian copper.

Trade Agreement.—The Anglo-U.S. zones of Germany have signed a trade agreement with Hungary whereby the former will send chemical products and machinery to the latter in return for agricultural produce and industrial goods.

Shell to Stay in Rumania.—Reports that the Shell Company was proposing to withdraw from Rumania have been categorically denied in London. "No decision of this character has been taken, and no such step is contemplated" an official of the company is reported to have said last week.

Swiss Dyes for Germany.—A trade agreement which has recently been concluded between Switzerland and the Russian zone of Germany (valid for one year), provides for the shipment of Swiss chemicals and dyes against German finished articles. The possibility of German potash deliveries to Switzerland is also envisaged.

Mexican Oil Agreement.—By an agreement between the Mexican Government and the Mexican Eagle Oil Co., Ltd., compensation will be paid to the company for properties expropriated by the Mexican Government in 1938, providing that British shareholders in the Mexican company will receive "just and equitable compensation."

Australian Chemical Shortage.—Because of the acute shortage of sodium sulphite in Australia, resulting from the earlier prolonged strike at the I.C.I. factory, in New South Wales, which previously supplied all the Continent's requirements, tanners have been paying 200 per cent more for small consignments from Karachi and double the home price for whatever can be had from the U.S.A.

German Pharmaceuticals.—The pharmaceutical manufacturing concern formerly known as Wenderoth at Kassel, U.S. Zone, has taken over the paper factory of Phillip Schnell which is not now in operation. The firm now hopes to increase its production, at present 40 per cent below the prewar level. The Wenderoth company has also resumed contacts with former foreign customers,

Dutch Coal Production.—The Dutch index figure for coal production per working day in August was 75 as against 74 in July. The basis working figure of 100 relates to 1938.

Insecticide Wanted.—A plague of insects is reported to be threatening to destroy about 25 million coffee trees in the State of Sao Paulo, Brazil, where coffee growers estimate their present losses at £1¼ million. No remedy so far tried has proved successful.

Nepheline in Canada.—Production of nepheline in Canada has increased as the result of the installation of a 300-ton mill at its Peterboro mine by American Nepheline Ltd. Almost the entire production is being despatched to U.S. glass and porcelain manufacturers.

Glass-Wool from Germany.—The "Springglas" GmbH. has been registered at Gelsenkirchen-Rotthausen with a share capital of 1 million marks. The company will commence the manufacture of glass-wool, glass rods and glass tubes at the plant of "Delog."

Argentina Suspends Imports.—The effect of Circular No. 821, issued by the Argentina Central Bank prior to the temporary suspension of the issue of exchange permits for all imports, is to withhold any further import quotas during the second half of 1946 for impure aluminium sulphate, lithopone and a number of other goods.

Dutch Oils and Fats.—The Dutch oil and fat industry with the joint help of the United Africa Company and the Unilever group proposes to commence the large-scale production of ground nuts and soya beans in the Netherlands East Indies. A preliminary investigation is to be made on the spot early next February.

Artificial Rain.—Following recent experiments—in Australia and elsewhere—in dropping dry ice on cloud formations to produce rain, the Australian Council for Scientific and Industrial Research is reported to be collaborating with the Royal Australian Air Force in spraying clouds with calcium chloride to the same end.

Treibach Works.—The Treibach Chemical Works, Austria, are producing 4250 lb. of ferro-molybdenum a month as well as considerable quantities of calcium carbide and water-glass. For the production of flints thorium is required and in spite of the importance of this material for atomic energy, the U.S.A. and Great Britain support the flint industry at Treibach by supplying thorium.

Company News

The nominal capital of **Vermex Chemical Co., Ltd.**, 20 Queen Street, Blackpool, has been increased beyond the registered capital of £2000, by £2000, in £1 ordinary shares.

The nominal capital of **Kemmet Trading Company, Ltd.**, chemicals, etc., 8 Greek Street, London, W.1, has been increased beyond the registered capital of £100 by £400, in £1 ordinary shares.

The Aluminium Company of Canada has recently purchased for sinking fund purposes, 21,976 of its 4 per cent cumulative redeemable Sinking Fund preferred shares, partly by tender and partly on the Montreal and Toronto Stock Exchanges.

The nominal capital of **Fairbank Kirby (Wholesale) Ltd.**, chemical manufacturers, etc., 7 Ropery Street, Grimsby, has been increased beyond the registered amount of £6000, by £2000, in £1 ordinary shares.

The Britannia Lead Company announces a dividend of 200 per cent from the profits for 1946, and an interim dividend of 40 per cent from the profits for 1947, both payable on September 25.

The nominal capital of **Barrywald Products Ltd.**, electrical and chemical equipment, etc., 1 Leadenhall Street, London, E.C.3, has been increased beyond the registered capital of £5200, by £1300, in £1 ordinary shares.

Indestructible Paint has raised its interim dividend for 1947 to 10 per cent, less tax, comparing with 7½ per cent paid for several years. For 1946 a final dividend of 22½ per cent brought the total for the year to 30 per cent.

The name of **Bowmans (Warrington) Ltd.**, manufacturing and retail chemists, oil and colourmen, etc., Moss Bank Works, Widnes, Lancs., has been changed to Bowmans Chemicals Limited, as from September 3, 1947.

The nominal capital of **Pharplast Processing and Supply Company, Ltd.**, manufacturers and processers of raw materials for the paint, plastic and fine chemical industries, etc., 143 Cannon Street, London, E.C.4, has been increased beyond the registered capital of £1000, by £1500, in £1 ordinary shares.

The Cementation Company announces a dividend of 25 per cent, less tax, payable to ordinary stockholders on October 10. The dividend recommended is payable on £171,500 Ordinary stock outstanding at March 31, 1947, and in accordance with the terms of issue, is payable on £53,500 of ordinary stock issued subsequently to March 31, 1947. Profits for the year amount to £140,256, compared with £91,382 for the previous year.

The nominal capital of **G. and E. Babey, Ltd.**, creosote manufacturers, Totton, Hants., has been increased beyond the registered capital of £2000, by £3000, in 2000 ordinary and 1000 6 per cent redeemable preference shares of £1.

Murex, Ltd., metallurgists, report a profit for the year ended June 30 of £159,093, compared with £201,490 for the previous year. A final dividend of 10 per cent and a bonus of 2½ per cent is recommended, making 20 per cent in all for the eleventh year in succession.

Peter Brotherhood Ltd., chemical engineers, have announced a net profit (without provision for taxation) of £66,850 as against £70,405 in the previous year. A final dividend of 12 per cent is recommended, which together with the interim of 8 per cent, amounts to 20 per cent for the year.

Lever Bros. and Unilever N.V. have issued a further Fl. 20,550,000 4 per cent redeemable cumulative preference shares in units of Fls. 1000 with the object of providing the company with working capital. A Dutch banking concern has acquired Fl. 8,550,000, while the Fl. 12,000,000 balance has been offered for sale to the public of Holland.

New Companies Registered

Triplex Safety Glass Company has declared an ordinary dividend of 10 per cent, less tax, for the year ended June 30, 1947. This compares with 7½ per cent for the previous year and 15 per cent for the two preceding years.

Boiler Insulation & Chemical Co., Ltd. (441,519).—Private company. Capital £1000 in 1000 shares of £1 each. Directors: C. E. Hall, C. Terlet and R. G. Rodgers. Registered office: 50 Stamford Hill, N.16.

Nu-Chemical Products, Ltd. (441,375).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, medicines, acids, alkalis, colours, gums, adhesives, pigments and varnishes, etc. Directors: J. Amelan and Kathleen Bowden. Solicitors: Amelan and Roth, 62 Market Street, Manchester.

Controlled Convection Drying Company, Ltd. (441,923).—Private company. Capital £250 in £1 shares. Designers and manufacturers of and dealers in chemical drying, heating, ventilating, air conditioning and allied plant and equipment, consultants on all engineering, industrial or domestic heating and drying problems, chemical manufacturing and processing, etc. Directors: F. Capper and Mrs. Alice Partington. Registered office: 42 King Street West, Manchester.

Robinson and Groom, Ltd. (442,233).—Private company. Capital £1000 in £1 shares. Manufacturers of and dealers in chemicals for bleaching, washing, cleansing and disinfecting, etc. Directors: J. H. Robinson, 269 Selbourne Road, Luton; C. Groom, and C. J. Birch. Secretary: C. J. Birch.

Fuel Analysts & Consultants, Ltd. (442,053). — Private company. Capital £1000 in 1000 shares of £1 each. Samplers and analysers of and consultants and advisers on coal and all other fuels, etc. Directors: M. E. Hughes, E. G. Tabraham, and T. Jenkins. Registered office: 124 Bute Street, Cardiff.

Neura Laboratories, Ltd. (442,325).—Private company. Capital £1500 in £1 shares. Consulting, analytical, manufacturing and general chemists, opticians, manufacturers of and dealers in proprietary articles, etc. Directors: H. J. Kenny and Mrs. Marjorie I. Kenny and Dorien Woodward. Registered office: National Bank Buildings, Fenwick Street, Liverpool.

Tyborite, Ltd. (442,345).—Private company. Capital £1000 in £1 shares. Manufacturers, exporters, importers, retailers and dealers in and processers of plastics, moulding wood and metal materials and compounds, organic or inorganic chemical substances and products natural or synthetic plastic substances, thermo-plastics and cellulose products or bitumen, etc. Directors: J. R. Morris and Ilse Hirschfeld-Jacobson. Secretary: Celia Silverman. Registered office: 409 Kilburn High Road, N.W.6.

Chemical and Allied Stocks and Shares

STOCK markets have been inactive with buyers holding off in view of uncertainty whether there will be an autumn Budget and plans for profit or dividend limitation. It is recognised that, granted export targets are reached, some companies might very well earn record profits, but although "export target" shares have attracted a good deal of attention, gains on balance have been moderate in most cases because of the assumption that the Government may propose some form of dividend limitation. On the other hand, while interest has centred mainly on companies with big export market scope, shares of companies associated mainly with the home market have remained out of favour, and generally the volume of business has been restricted and not sufficient in most sections for any very definite trend to develop. British Funds were also uncertain, sentiment being affected to some extent by Mr. Dalton's forecast of further sales of gold to America.

Chemical and kindred shares received rather more attention in view of export trade expansion hopes, and prices moved higher on balance, although best levels were not held. Imperial Chemical were better at 47s. No change is being expected in the forthcoming interim dividend. The general assumption is that the total payment for the year may be unchanged at 10 per cent, but that in respect of 1948 there may very well be an increase above this rate, granted that export targets are achieved and that there is no scheme of dividend limitation. Moreover, it continues to be assumed in the market that in due course it will be decided to "split" the existing £1 units into four units of 5s. each. Monsanto Chemicals have been more active up to 56s. 6d., while Greeff-Chemicals Holdings 5s. shares have been steady at 15s. 6d. awaiting the interim dividend. B. Laporte were 80s., and W. J. Bush 87s. 6d., with Fisons active around 66s. 3d. The units of the Distillers Co. rose to 136s. 3d. in view of the great financial strength displayed by the consolidated accounts. United Molasses were firm at 47s. 6d., and there was a better tendency among paint shares with Goodlass Wall 36s. 3d., and Pinchin Johnson 55s., International Paint also strengthened to £6½.

Textiles remained in favour in view of export trade scope, but best prices were not fully held. Bradford Dyers showed a fresh rise to 23s. Calico Printers were 22s. 6d., and Bleachers 11s. 7½d. Courtaulds were 48s., and awaiting the dividend announcement British Celanese displayed activity at the higher level of 27s. Iron and steels showed firmness in view of the industry's good progress and the belief that the upward trend in output is continuing. United Steel were helped by expectations that the dividend will be maintained and have strengthened further to 25s. 9d. Dorman Long were 24s. 6d., Guest Keen 46s. 9d., Babcock & Wilcox 70s. Allied Ironfounders 53s., while Tube Investments rose to £6 3/16. Wm. Cory were good at 94s., and Lambert Bros. 81s. 6d. In other directions, Amalgamated Metal improved to 15s. 10½d., Imperial Smelting were 18s. 7½d., and General Refractories 21s. Moreover, British Aluminium at 45s. 3d. have remained under the influence of the interim dividend and the belief that demand for the metal is continuing to expand. Boots Drug were 56s. 9d., Beechams deferred 23s., and Griffiths Hughes 43s. 9d., while Sangers were 28s., and Timothy Whites 41s. 6d. British Glues & Chemicals 4s. ordinary have been steady at 18s. 9d. Oil shares were unsettled by international political news, Anglo-Iranian continued to fluctuate sharply, although exceptionally, Trinity Leaseholds strengthened, changing hands around 90s.

RISING CANADIAN CHEMICAL EXPORTS

STATISTICS contained in *Foreign Trade* (*II.* No. 34, August 23, 1947) show that during June of this year exports of all groups of commodities (in dollar values) have been tremendously increased compared both with June last year and June, 1938. The following (Table I) is extracted from the table of main groups, the figures representing millions of dollars:

TABLE I

	June '38	June '46	June '47
Chemicals and allied products	1.7	5.2	9.2
Iron and products ...	6.2	24.7	26.4
Non-ferrous metals and products	11.8	17.4	26.8
Non-metallic minerals and products ...	2.3	5.0	6.9

A break-down of the chemicals and allied products group shown in Table II reveals that the most marked increases in that section occurred in the production of fertilisers, paints and varnishes, and "other chemical products," the last-mentioned presumably embracing pharmaceuticals and fine chemicals.

TABLE II

CHEMICAL AND ALLIED PRODUCTS
(*Thousands of dollars*)

	June '38	June '46	June '47
Acids	119	128	307
Medicinal preparations	115	436	520
Fertilisers	525	2,370	2,936
Paints and varnishes	72	259	1,008
Calcium compounds	42	364	262
Soda and sodium compounds	369	334	333
Chemical products, other	414	1,264	3,802
Total ...	1,654	5,155	

With regard to non-metallic minerals and products, shown in Table III, the figures are consistently and progressively higher for each of the five break-down sections, except for that of coal, which appears to have experienced a setback to the 1938 level.

TABLE III

NON-METALLIC MINERALS, PRODUCTS
(Thousands of dollars)

	June '38	June '46	June '47
Asbestos and products	1,242	2,295	2,824
Coal	124	622	166
Petroleum and products	123	217	881
Abrasives, artificial, crude	280	911	1,071
Non-metallic products, other	484	922	1,939
Total ...	2,253	4,967	6,882

New Chemical Companies

Of the 24,002 new companies registered in this country during 1946, 380 were engaged in the manufacture or distribution of chemicals. The capital involved amounted to £2,202,043. 109 new firms entered the plastics industry with a capital expenditure of £721,170.

PAINT INDUSTRY'S RAW MATERIALS

WRITING in *The Board of Trade Journal* of September 20, Dr. L. A. Jordan, director of the Research Association of British Paint, Colour and Varnish Manufacturers, reviews the work of the association's laboratories.

With regard to new synthetic resins now widely available in the U.S.A. and to some extent also in this country, the author maintains that dependence must be placed on the older paint-making materials, though his reference to "circumstances in Britain to-day" may be taken as a possible hint that he is not entirely unsympathetic to the new products. Linseed oil, Dr. Jordan asserts, must remain the best medium for paints—if adequate supplies are readily available.

Tung oil is another well-known drying oil for which substitutes have been sought, chiefly by manipulation of castor oil—though other oils have been used. Attempts have also been made, according to Dr. Jordan, to find a linseed oil substitute by the same means using semi-drying oils such as soya or rubber-seed oil.

Referring to the paint industry as a whole, Dr. Jordan describes it as largely a chemical process with a highly specialised technology. This, he says, has arisen from even more specialised subjects—surface chemistry of solids, and the physico-chemical aspects of wetting, dispersion and flocculation.

SCOTTISH SEAWEED RESEARCH

THE Institute of Seaweed Research has been established by the Scottish Seaweed Research Association at Musselburgh and was officially opened on September 19.

Pointing to the present wastage of potentially valuable chemicals, Major Philip Jackson, acting director of the association, said that only alginic acid was being extracted from seaweed. For every ton of alginic acid extracted, three tons of potentially useful chemicals were being lost. Steps are being taken to correct this position and new products are promised in the near future, one such being mannitol, used in the plastics industry. The crux of the successful development of this industry and of use of seaweed products in many other industries, is the successful harvesting of the weed. Six methods of collection have been discussed and results are promising, but a fuller survey of mechanical collection methods is essential before success can be claimed.

Among the industries using seaweed products are textiles, adhesives, fertilisers, foodstuffs, fibres, papers, printing inks, medicinal products and varnishes.

Prices of British Chemical Products

THERE is a ready outlet for practically the whole range of industrial chemicals, the market demand continuing strong. In some instances consumers contract delivery specifications are being increased and there is little likelihood of any change in the present firm conditions of the market. Among soda products, there is a steady call for sodium sulphide, sodium bicarbonate and sodium sulphate, while the supply position of soda ash remains difficult. Chlorate of soda continues in good request and the demand for bichromates is in excess of supplies. With the possible exception of permanganate of potash, all the potash chemicals are in comparatively short supply for spot or nearby delivery. The demand for paint raw materials is persistent and prices are firm. The call for oxalic, acetic, tartaric and citric acid is such that offers are finding ready outlet. The only feature of the firm coal-tar products market, virtually unchanged, is the strong demand for pitch for both home and export accounts. No announcement has yet been made regarding the expected upward revision of control prices.

Manchester.—Steady trading conditions have been reported on the Manchester chemical market during the past week. Fresh inquiries from home industrial consumers, including the textile and allied sections, have been numerous and have covered a wide range of both light and heavy chemicals. Actual additions to order books have amounted to a substantial quantity in the aggregate. Shippers have also been in the market and are pressing for supplies for export, the delivery dates in respect of overseas business are not easy to arrange. Throughout the market prices remain on a very firm basis. In the by-products, pitch, crude tar, creosote oil and most of the light materials are going steadily into consumption.

Glasgow.—Business in the Scottish heavy chemical market has shown little change during the past week, although considerable activity has been observed in synthetic detergents and soap substitutes.

In the export market inquiries continue on a large scale, especially for fertilisers and alkalis, and orders have been booked for potassium nitrate and sulphur. Greece has proved to be an active market these past few weeks, although import licences are seemingly difficult to obtain in that country.

Price Changes

Rises: Barium carbonate, barium sulphate, formaldehyde, hydrogen peroxide, lead acetate, lead nitrate, litharge, magnesite, potassium carbonate, salicylic acid, sodium sulphate, sodium sulphide, barytes, carbon tetrachloride and pitch.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £56 10s.; 80% pure, 1 ton, £58 10s.; commercial glacial 1 ton £70; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 1/5 tons, £86 10s.; single drums, £87 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. Manchester: £16 to £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. Manchester: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—Manchester: £40 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5 cwt. casks. Manchester: Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Persulphate.—Manchester: £5 per cwt. d/d.

Antimony Oxide.—£162 10s. per ton.

Arsenic.—Per ton, 99/100%, £38 6s. 3d. to £41 6s. 3d., according to quality, ex-store.

Barium Carbonate.—Precip., £22 per ton d/d; 2-ton lots, £22 per ton, bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £22 per ton d/d; 2-ton lots, £22 5s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s.

B.P., crystals, £39; powdered, £39 10s.; extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: 1s. 7d. per lb

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£44 12s. 6d. per ton f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., from 201s. to 205s. per cwt. lots, d/d.

Formaldehyde.—£28 to £29 per ton in casks, according to quantity, d/d. MANCHESTER: £29 10s.

Formic Acid.—85%, £54 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., £6 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d per lb., according to quantity.

Lactic Acid.—Pale tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 110s. to 115s. per cwt., according to quantity.

Lead Nitrate.—About £95 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil: Red, £132; orange £144. Ready-mixed lead paint: Red, £140; orange, £152.

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton Ground in oil, English, in 5-cwt. casks, £141 per ton.

Litharge.—£103 10s. to £106 per ton, according to quantity.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. 10d. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 4s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works.

Oxalic Acid.—£100 to £105 per ton in ton lots packed in free 5-cwt. casks. MANCHESTER: £5 to £5 5s. per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d. per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots

Potassium Chlorate.—Imported powder and crystals, nominal.

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8¼d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 2s. 2d. to 3s. 0d. per lb. d/d.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Hyposulphite.—Pea crystals 22s. 6d per cwt. (2 ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£18 per ton. d/d U.K. in ton lots.

Sodium Nitrite.—£23 per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £30 10s. per ton d/d for ton lots. Tri-sodium, £35 per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk. MANCHESTER: £4 12s. 6d. to £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £22 2s. 6d. per ton, d/d, in drums; crystals, 30/32%, £15 2s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 15s. per ton;; 140° Tw., arsenious, £4 7s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1 cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £68 15s.; green seal, £70 5s.; red seal, £71 5s.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 3s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£50 10s. to £53 10s. per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d to 1s. 5¾d. per lb.; dark, 10¼d. to 1s. per lb.

Lithopone.—30%, £32 17s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

Vermilion.—Pale or deep, 15s. 6d. per lb. for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in December £20 4s. 6d., rising by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December £9 18s. 6d., rising by 1s. 6d., per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb. Crude, 60's, 4s. 3d. Manchester: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. Manchester, 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. Manchester: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal. for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. to 80s. per ton f,o,r. suppliers' works; export trade, £7 10s. per ton f.o.b. suppliers' port. Manchester: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. Manchester: 14s. 6d. to 18s. 6d. per gal.

Toluol.—Pure, 3s. 2¼d. per gal.; 90's, 2s. 4d. per gal. Manchester: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d.

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

***m*-Cresol** 98/100%.—Nominal.

***o*-Cresol** 30/31° C.—Nominal.

***p*-Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

***p*-Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

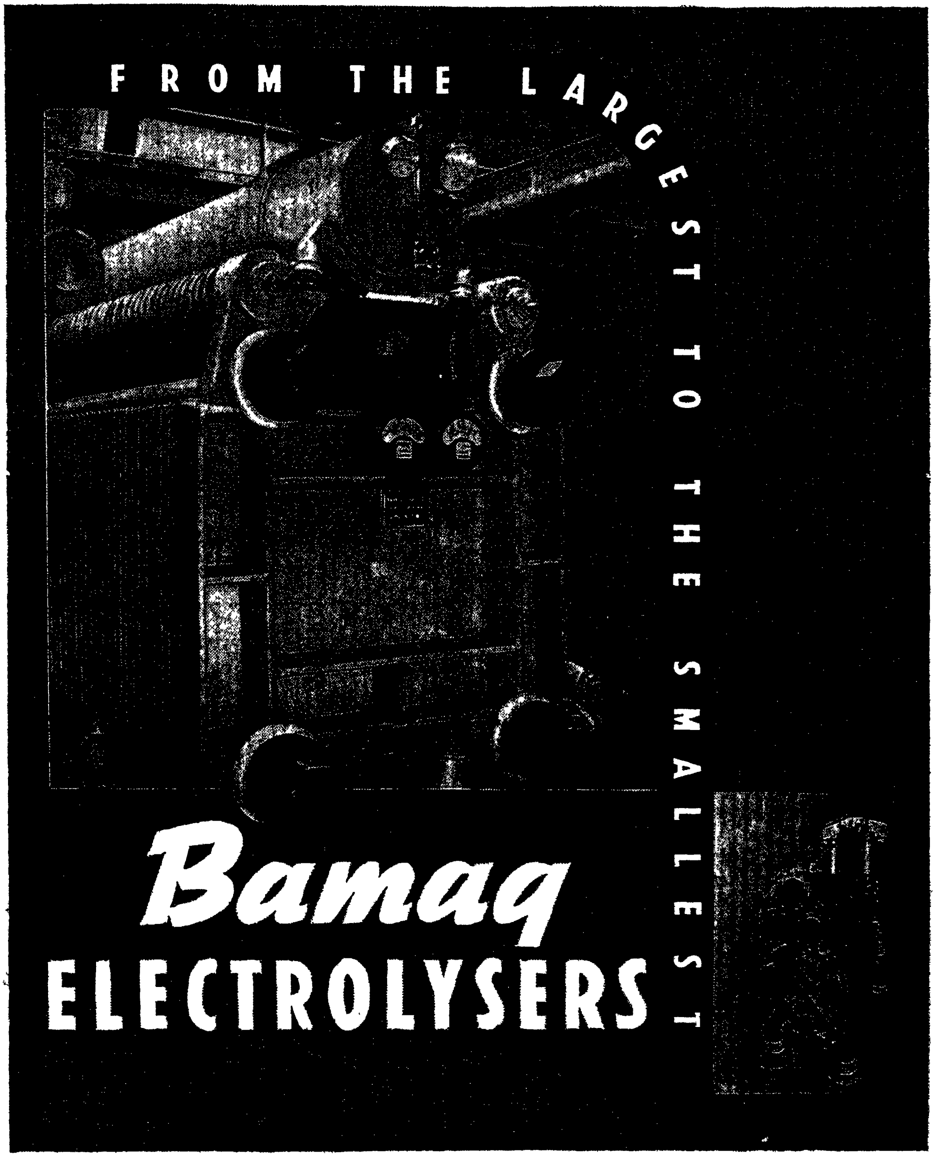
***o*-Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

***p*-Toluidine.**—2s. 2d. per lb., in casks.

***m*-Xylidine Acetate.**—4s. 5d. per lb., 100%.

Latest Oil Prices

London.—September 15. For the period ending September 27 (Oct. 11, 1947 for refined oils), per ton, naked, ex mill, works or refinery, and subject to additional charges according to package; Linseed Oil, crude, £200. Rapeseed Oil, crude, £190. Cottonseed Oil, crude, £109; washed, £112. Coconut Oil, crude, £106; refined deodorised, £112; refined hardened deodorised, £116. Palm Kernel Oil, crude, £105 10s., refined deodorised, £112; refined hardened deodorised, £116. Palm Oil (per ton c.i.f.), in returnable casks, £99 5s.; in drums on loan, £98 15s., in bulk, £97 15s. Groundnut Oil, crude, £110 10s.; refined deodorised, £114, refined hardened deodorised, £118. Whale Oil, refined hardened, 42 deg., £117; refined hardened, 46/48 deg., £118. Acid Oils, Groundnut, £94; soya, £92; coconut and palm-kernel, £97 10s. Rosin: Wood, 40s. 6d. to 48s.; gum, 56s. to 62s. 6d. per cwt., ex store, according to grade. Turpentine, American, 87s. per cwt. in drums or barrels, as imported (controlled price).



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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Production of alloys of an alkali metal and lead.—A. Johnson & Co. April 22, 1943. 19216/1947.

Chemical process for the manufacture of guanidine nitrate. — Koppers Co., Inc. Jan. 18, 1946. 18857/1947.

Process for manufacture of magnesium products. — Marine Magnesium Products Corporation and G. H. Gloss. May 10, 1943. 21850/1946.

Chemical compounds and processes of preparing the same.—Merck & Co., Inc. Feb. 15, 1946. 3521/1947.

Electrolytic oxidation process.—Merck & Co., Inc. Nov. 6, 1941. 18887/1947.

Oxidation process.—Merck & Co., Inc. Nov. 6, 1941. 18888/1947.

Methods of making condensation products of organic mercaptans and primary amines, and the improved condensation product resulting therefrom.—Monsanto Chemical Co. July 26, 1940. 19110/1947.

Modified rosin esters and compositions containing them.—Montclair Research Corporation. April 14, 1944. 19527-29/1947.

Extraction of vanadium and phosphorus.—Montecatini Soc. Generale Per L'Industria Mineraria e Chimica. April 22, 1939. 19470/1947.

Separation of penicillins.—C. Pfizer & Co., Inc. Oct. 17, 1945. 19111/1947.

Solvent extraction of glycerides and derivatives thereof.—Pittsburgh Plate Glass Co. May 13, 1940. 19458/1947.

Acetyl salicylic acid preparation.—S. Quisling. Jan. 8, 1941. 19310/1947.

Treatment of abietyl compounds.—Ridbo Laboratories, Inc. July 3, 1943. 18962/1947.

Method of preparing cyanamide and derivatives thereof.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St-Gobain, Chauny & Cirey. Feb. 15, 1946. 4000/1947.

Catalysts and catalytic processes.—Soc. Normande de Produits Chimiques. Feb. 15, 1946 4601/1947

Manufacture of carbon disulphide.—Standard Oil Development Co. March 6, 1943. 24814/1946.

Oxidation process.—Standard Oil Development Co. Nov. 9, 1940. 19905-6/1947.

Method for recovering bitumen contained in peat.—A. F. Sundgren and E. E. Ekman. Feb. 12, 1946. 4099/1947.

Process for effecting catalysed reactions.—Universal Oil Products Co. Jan. 30, 1939. 19580/1947.

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Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (16 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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The Electron

IT is difficult for us, who live so near to the event, to realise the immense growth of knowledge that was, and perhaps still is, to come from the discovery of the electron. The Institute of Physics has just celebrated the jubilee of this discovery and it is meet that we should pause for a moment in our consideration of molecules to think of the construction of the atom and what it has meant and may mean to mankind.

The study of the discharge of electricity through rarefied gases led J. J. Thomson to the discovery of the electron. Previously, the science of chemistry had been based on the classical hypothesis that the atom was the smallest indivisible particle in nature. Different combinations of atoms were found leading to new compounds, but in many respects the science seemed to have reached, if not an end, at least the lane leading to the end. The almost simultaneous discovery of the electron and radio-activity gave added point to the new ideas that began to move scientific men into new paths. Helmholtz had suspected the existence of the electron in 1882, but not until about 1896 were his views confirmed experimentally. It became clear at once that electricity is also atomic in nature, " an electric current or an electrical discharge consisting of the flow of negatively-charged atoms of electricity, each having a mass about 2000 times less than that of the hydrogen atom " (Tolansky). These tiny particles, 1/2000th of that of the smallest known atom, were found to be constituents of every atom of whatever element it represented. They carry the smallest electric charge known in nature, all charges being simple multiples of the elementary unit, the electronic charge. Since there were many of these in the atoms of heavier elements, it was soon obvious that in order to prevent the atoms from bursting asunder through the mutual repulsion of these charges, it must contain also a positive nucleus within it equal and opposite in charge to the sum of the electrons.

This hypothesis was accepted by most physical chemists, so that in 1921 we find Prof. W. C. McLewis (" A text-book of physical chemistry ") writing: " It is assumed that a neutral atom consists of a sphere of positive elecricity (J. J. Thomson) which contains a number of corpuscles moving in various orbits, the number of such corpuscles and the kind of motion they possess being the ultimate source of chemical and physical properties." Lewis considered it desirable to examine the evidence in favour of the real existence of " corpuscles " from which it may be inferred (correctly) that even at that date not all scientific workers were disposed to regard them as real. However, some years earlier, Prof. Soddy in his book "The Chemistry of Radio-elements " published in 1916 had said : " Chemical and electrochemical changes of valency are concerned with electrons in the outermost ring, and are reversible by loss or gain of electrons from without. Radio-active changes are concerned with changes in the inner nucleus, and such changes are not reversible by loss or gain of electrons from the ring." That was a forecast of modern theory quite remarkable at that early date. As long ago as 1813 Prout had suggested that all atoms were built up of units of

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the simplest of all, hydrogen. Recent work on atomic physics has shown, through the existence of isotopes, how near to the truth also was Prout's guess; the individual atomic nuclei are now known to be built up by different re-arrangements of a few fundamental particles, and because some of these arrangements are unstable they disintegrate spontaneously with the emission of radiation, giving rise to radioactivity.

Thus it became evident that both matter and electricity are atomic in character. This prepared the way for Planck's quantum theory which showed that radiation is also atomic. Electromagnetic radiation travels in small discrete quanta, or "packets," which in effect are atoms of radiation. The classical conception of waves has thus been discarded in favour of the corpuscular concept which in fact was first introduced by Newton, and then discarded. The important thing was that in some degree matter, electricity and radiation were shown to be similar in character and interchangeable. If therefore matter can be converted into radiation, what a source of power is put into the hands of the human race!

Thus from the discovery of the electron there has grown up a new physics and a new conception of chemical reactions as being the interchange between the electrons in the outer atomic rings of interacting atoms. From the study of the nucleus has come the realisation that many kinds of particles go to make up an atom. There is the nucleus, small, heavy, approximately 10^{-12} cm. in diameter, surrounded by an almost empty region 4000 times larger in diameter (*i.e.*, 10^{-8} cm. diameter) in which move the electrons somewhat like planets moving in orbits round the sun. The nucleus contains protons, positively-charged; neutrons, particles having no charge and approximately equal in mass to the heavy protons; positrons, particles of the same mass as the electron, but positively-charged; mesons, 50 to 500 times heavier than the electron and charged positively, negatively or uncharged; and the neutrino, an uncharged particle of mass much less than even that of an electron. Experimentally, the transmutation of one element into another and of matter into energy has been demonstrated, leading in turn to the atomic bomb and the possibility of transmuting matter into energy on the commercial scale for power production. A whole world, an exciting new world, of possibilities has been opened to man by the discovery 50 years ago of the electron. We do not yet know where it will lead us. The fact is that this new discovery of the atomic pile and the chain reaction due to the interaction of neutrons with the nuclei of certain elements is too recent for us yet to have more than a glimpse of its possibilities. It is reasonable to place our present estimates on a par with those held when the first commercial use of electricity was suggested but not yet put into practice. Who could have foretold the wonderful new processes that electricity would make possible? Equally, who knows what the future may bring in the light of atomic research? To-day, emphasis is placed upon the neutron—a particle unknown before 1930—and upon its effect on the atomic nuclei of U235 and plutonium, and of thorium. To-morrow, who knows, it may be the meson, the positron, or even the tiny neutrino that takes pride of place; it may even be none of these but some particle as yet undiscovered. It is significant that while to-day we can transmute matter into energy by splitting the atomic nucleus into two halves, we yet know that a much greater, literally inexhaustible, supply of energy could be obtained if we could build heavier atoms from the lightest. But how? That is the questionmark of the future, a problem upon which we have not even started to work. The present results of the discovery of the electron are tremendous. The future developments are as yet unforeseeable, but are undoubtedly greater still. That is the reward that the world reaps from the encouragement of pure science.

NOTES AND COMMENTS

Educating the Chemist

RECOMMENDATIONS which, if adopted, would have far-reaching effects on the training and status of the chemist from his first introduction to chemistry in the school laboratory are contained in the current report of the Education Committee of the British Association of Chemists which, under the chairmanship of Mr. E. Leighton Holmes, has evidently brought to bear a great deal of painstaking study and practical experience on the subjects of the teaching of chemistry in schools and the training of industrial chemists and technicians. The need for such a study as this is established by the reminder in the introduction of the increasing dependence of industry and the country at large on science and chemistry and the committee has taken the view that even the early formative stages of the chemist in embryo are worthy of more attention than they appear to be receiving. Sensibly, the committee recommends, however, that no attempt should be made to force the pace; no study of science as a formal subject before the age of 11 and no premature specialisation. So vast is the field of chemical study and so rapidly is it widening that there can be little ground for dispute with the committees plea for longer and fuller preparation—with emphasis on the study of languages and literature—and increasing the pass degree course at the university from three to four years. How that is to be compassed within the time available after the National Service term has been served is a matter about which the committee confesses it is not sure, but it recommends that students obtaining entrance to a university should be permitted to do their service in a college cadet corps. That such a privilege can be secured seems at the moment unlikely, and it would in any case offer no relief to the problem of training some other classes of students, such as the laboratory technicians for whom the committee suggests definite standards to qualify for their place in a chemical hierarchy (after " senior chemists," " chemists " and " chemical assistants ") for which " improved standards of remuneration commensurate with the degree of qualification " are sought.

In Darkest Russia

SCIENTISTS throughout the world should be grateful to Mr. Eric Ashby for his book " Scientist in Russia " which throws a clear light on scientific thought and progress in Russia, in marked contrast to the fog of pro- and anti-Russian propaganda which surrounds most comment on Russian science. Mr. Ashby, a botanist, who was the first scientist to be accredited to a Legation in Moscow, was sent out by the Australian Government. Through his own efforts, and in spite of Russian Bureaucracy, he managed to make his way about the country—in marked contrast to many diplomats who complain bitterly of Russian restraint on their movements. The story Mr. Ashby has to tell will not please everybody, but it is a story that will certainly interest and amuse British chemists.

Made to Measure

MR. ASHBY answers the question frequently raised—How is the Russian scientist educated? There is no choice of subjects in the lower schools. Every child follows the same course, and each one who completes ten years of schooling has covered a course which includes a foreign language, chemistry, physics, biology, astronomy and mathematics, literature, political science and military training. Among the objects of the chemistry course are : " To make the pupil acquire, while learning the facts, theories and laws of chemistry, and the problems of their practical application, a dialectic material (and in particular anti-religious) outlook on natural phenomena." But nineteen out of twenty children leave school before they have completed the ten-year course. Among the reasons Mr. Ashby gives for this are: a large voluntary withdrawal of children from school by their parents, for in Russia as elsewhere the poor need to have their children earning as soon as possible; and the compulsory call-up of children for the labour reserves. After this secondary education students are admitted to higher education institutes between the ages of 17 and 35. Fees from 300 roubles to 500 roubles per annum are charged and the student works for four or five years, at the end of which he may take as many as 45 examinations, including an examination in Marxism-Leninism. The student who wishes to become an industrial chemist has these alternatives open to him: he may enter a university which trains chemists for "pure research," or he may enter one or other of the twelve institutes for chemical technology. Students in their fifth year at a technical institute do not (as in the university) engage on a research problem; instead they have to plan a factory or a chemical plant. Having successfully passed through the university or technical institute a would-be research worker has to go through a course of post-graduate training which consists of two years as an "aspirant" followed by an examination and the presentation of a thesis. If the "aspirant" passes he is called as a "candidate" and begins research for a doctor's degree, receiving from 600 to 1000 roubles a month.

He Confessed

TO the question "What does the Russian scientist think of the Russian government?" Mr. Ashby replies that in general to the scientist as to the ordinary Russian man or woman the Communist régime is accepted as something inevitable and tolerable, though hard: like the climate. In the science institutes, which are under the control of the Academy of Sciences, and where government scientific work is carried out, a minority of the workers belong to the Communist Party. But all workers are under the observation of the party, probably through agents of the N.K.V.D. (formerly the notorious OGPU). In connection with these latter gentlemen Mr. Ashby gives an amusing account of a three-days' journey from Moscow to Murmansk in company with a colonel of the N.K.V.D. whose very presence cast a chill over the company. The aloofness of these agents may be gathered from the fact that it took Mr. Ashby three days to thaw out the colonel—and he never found out his name. The amusing story in the columns of the *Daily Telegraph* this week may well have originated in Russia. A British lecturer, giving an elementary lesson on British literature to a Russian audience in Moscow, began with a few simple questions. He asked one man—"Who wrote 'Hamlet'?" The man was discomfited, but vigorously denied writing the play. N.K.V.D. officials present decided that the man "might be telling the truth." But some days later the lecturer was rung up by the N.K.V.D. who told him: "Likudsky has now broken down. He has confessed that he did in fact write 'Hamlet'." But there is hope in Mr. Ashby's conclusion that the Russian scientist is, without doubt Britain's keenest ally in our efforts to break down government-imposed barriers.

Progress by Candlelight

FAR and wide are cast the benefits of nationalisation and no place, it seems, is too small to share the fruits. To the village of Abernethy between Perth and Newburgh the prospect that the gas industry may be nationalised and the fact that the collieries have been—with effects upon the price, quality and availability of coal with which we are familiar—has brought an urgent demand for candles. Later, maybe, it will be rushlight. For longer than most people can remember Newburgh has had its own gas supply provided by the private gasworks of Mr. James R. Stevens. That was before nationalisation had cast its benison. Since then Mr. Stevens has been seeking to sell his gasholder, retorts, goodwill and all that goes with a private gas company to Perth Town Council, who might or might not be able to make gas economically at current coal prices. Perth decided otherwise and, they added, the prospect of nationalisation and the unwillingness of the Ministry of Fuel to give a guarantee against loss should the industry be taken over made the proposition wholly unattracive. So the gas jets in Abernethy's cottage homes flickered and went out. The tide of centralisation sweeps bravely on its way.

Chemical Trading in August

Export—Import Returns Show Adverse Trend

A WIDESPREAD falling off of U.K. exports of chemicals and a fairly consistent rise in the import totals are observable in the August Trade and Navigation Accounts of the U.K. (H.M.S.O., 4s. 6d. net). The market diminuation in overseas trading is by comparison with August totals a year ago, but the trend is also apparent in many cases when contrast is made with the returns for last July. Particularly heavy was the falling off in sales of the sodium group of chemicals, of which carbonate disposals were halved at 226,344 tons, although this was not greatly lower than the return for July. Caustic soda underwent proportionately an even greater reduction to 100,551 tons, which compares with nearly 245,000 tons a year before.

Salt sales also dropped nearly 2000 tons to 18,544 tons. Other striking reductions were of chromate and bichromate from 1177 tons in August last year to 43 tons, of sulphate and salt cake.

The strong rise in volume of imports is chiefly marked in purchases of acids, which were already apparent in the last monthly figures, and in heavy buying of calcium carbide—42,020 cwt., against 1670 cwt. last month and 987 cwt. a year ago. Carbon blacks represented another notable increase, to over 109,000 cwt., compared with some 67,000 cwt. in 1946.

CHEMICAL EXPORTS

	Aug., 1947	Aug., 1946
	Cwt.	Cwt.
Citric acid	423	1,196
Formic acid	3,877	4,925
Tartaric acid	651	813
	Tons	Tons
Aluminium oxide	510	20
Sulphate of alumina	2,219	3,340
All other kinds	374	521
Ammonium compounds	26,952	24,760
Nitrate	2,470	4,850
	Cwt.	Cwt.
Bleaching powder	35,558	40,899
Calcium carbide	1,294	18,939
	Gal.	Gal.
Benzol	257,988	755,326
Cresylic acid	149,136	303,485
Tar oils	3,194,111	162,861
	Tons	Tons
Copper sulphate	809	2,358
	Cwt.	Cwt.
Disinfectants, etc.	49,558	71,728
Glycerine	160	7,976
Lead acetate, litharge, red lead, etc.	5,677	7,109
	Gal.	Gal.
Tetraethyl lead	59,097	—
	Cwt.	Cwt.
Nickel salts	4,279	11,990
Potassium compounds	5,187	10,729
	Tons	Tons
Salt	16,092	18,544
	Cwt.	Cwt.
Sodium carbonate	226,344	465,294
Caustic soda	100,551	244,957
Chromate and bichromate	43	1,177
Silicate (waterglass)	6,348	12,374
	Oz.	Oz.
Quinine and its salts	113,141	177,988
	Mega Units	Mega Units
Penicillin	168,536	—
	Cwt.	Cwt.
Coal-tar dyestuffs	15,845	18,567
Extracts for tanning	10,924	19,146
Earth colours	13,210	16,358
Lithopone	2,249	13,750
White lead	342	1,377
Soap (excluding toilet, shaving and abrasive)	19,929	12,626
Paraffin wax	3,047	300
*Total value of chemical manufactures (excluding drugs and dyes)	3,073,601	3,398,005

CHEMICAL IMPORTS

	Aug., 1947	Aug., 1946
	Cwt.	Cwt.
Acetic acid	9,974	4,708
Boric acid	4,000	—
Tartaric acid	900	—
All other kinds of acid	2,815	13
	Tons	Tons
Ammonium phosphate	3,062	5
	Cwt.	Cwt.
Borax	13,500	7,100
Calcium carbide	42,020	987
Glycerine	116	10
	Lb.	Lb.
Iodine	59,569	119,142
	Cwt.	Cwt.
Caustic and lyes	2,724	2,742
Potassium chloride	775,532	343,617
Potassium sulphate	29,210	1,840
All other potassium compounds	3,169	833
Sodium nitrate	19,940	132,689
	Pf. Gal.	Pf. Gal.
Ethyl alcohol	270,049	—
	Oz.	Oz.
Quinine and its salts	137,550	—
	Lb.	Lb.
Menthol	9,918	5,498
	Cwt.	Cwt.
Synthetic organic dyestuffs	503	489
Carbon blacks	109,308	67,156
	Lb.	Lb.
Essential oils		
	Cwt.	Cwt.
Turpentine	12,825	5,399
Paraffin wax	56,748	38,786
	£	£
*Total value of chemicals, drugs, dyes and colours	2,591,018	1,536,852
*Oils, fats and resins	8,801,517	7,698,446

* *Including some commodities not listed here.*

JOINT PRODUCTION COMMITTEES

"The usefulness of joint consultation, when carried out in the right spirit, has been proved by experience," said Mr. George Isaacs, Minister of Labour, outlining at the conference at Oxford last week of the Confederation of Management Associations the Government plants to revive voluntarily a system of consultation between managements and workpeople of the type which operated with marked success in the war. He emphasised that only when agreement has been reached at a national level within an industry will the regional industrial relations officers seek to set up joint production committees.

Training and Status of Chemists

Comprehensive Recommendations by the B.A.C.

"EDUCATION in Chemistry" the report of the education committee of the British Association of Chemists, which the association has now issued in booklet form (2s.) provides in a comparatively small compass the most comprehensive survey of chemical education yet attempted. It reviews in 29 pages the teaching of chemistry in schools, the training of chemists and chemical technicians for industry, the recruitment and training of teachers and some associated subjects, representing the findings of a committee of 12 experts of which Mr. E. Leighton Holmes was the chairman.

Longer Training

Practically all the findings of this committee are conditioned by the recognition that the scope of chemical science is today so wide, and so elaborate are its ramifications that more extended study is required at almost every stage. The committee consistently recommends wider study for longer periods whenever this is possible and does not underestimate the importance of ancillary equipment such as the study of languages and literature and the "humanities."

Summarising its objectives, the committee states:—

The granting of equivalent status to qualifications in technology and pure science is recommended and the desirability of providing alternative avenues of approach to the professional status of chemists is advocated. It is felt that efforts to achieve unity within the profession should be intensified. . . . Finally, it is emphasised that anyone reaching a given standard of education should be adequately recompensed, so that juniors will receive proper encouragement to improve their status.

Of university training, the report observes:—

During recent years there has been a tendency, especially in the modern universities, to convert university education into a continuation of school teaching. This is largely the result of the enormous increase in scientific knowledge which it is felt should be crammed into the student, but it should be recognised that the student at the university must not only be taught, he must educate himself to take part in the social life of the college and of the world at large. . . . It appears to us that the only way in which these important hopes can be realised is by increasing the normal pass degree course from three to four years.

Master's Degree

After recommending an increase of the proportion of practical work and criticising the tendency to pay too much attention to a few brilliant students at the expense of the ordinary student, who remained "the backbone of the profession," the report says:—

A better arrangement would be for all graduates to pass an examination in fundamental knowledge of all branches of chemistry which are essential to everyone who seeks to call himself a chemist. Degrees of various classes would then be awarded for a high standard of proficiency in the same examination taken by all degree students in chemistry and there would be no special subjects or additional time required or allowed for the Honours qualification. Full attendance for a minimum period of four years for a degree is no doubt desirable, as stated above, but it is doubtful if it is practicable.

Students who have ability should then be encouraged to spend another one to one and a half years specialising in some branch of chemistry, inorganic, organic, physical, industrial, metallurgical, analytical or biochemical, or in chemical engineering, possibly with compulsion to study a suitable subsidiary subject.

On the result of such an examination he should then be awarded a Master's degree, for which Honours can be awarded.

Some scheme of this nature would result in chemists of far better calibre than the present system, and the Bachelor's degree would meet the needs of those who wished to take up school teaching as a career. The present B.Sc. Honours degree and course of Higher standard would thus become the Master's degree and would involve training in research methods combined with an additional examination in a specialised branch of chemistry.

Professional Status

One of the ultimate objectives of the committee's study was to provide clearly defined standards of chemical attainments as well as their acquisition, and a large section of the report is concerned with professional status of chemists and chemical technicians in industry. It observes:—

One of the main difficulties in discussing the training of chemists arises from the number of ways in which a knowledge of chemistry may be gained and become the source of livelihood. There is also in many quarters the insistence on making a distinction between the "professional" and "non-professional" grades.

It has to be recognised, however, that the same "professional" standards expected of the independent consultant require some modification when applied to the wide range of people employed in chemistry at the present time in industry or in teaching. In many factories, for example, men who have reached managerial rank after taking their degrees in their spare time, or who have studied for their degrees at a university, are working side by side with others who have acquired the same status as the result of factory experience alone.

To define the transition point at which a chemist enters the professional class is to make too fine a distinction under modern conditions. It is, however, necessary to attempt a classification for chemists and others engaged in chemistry, so that appropriate educational schemes and qualifications can be satisfactorily applied.

We consider that, once recognised qualifications are agreed for the sub-degree levels, the use of the word "professional" should be restricted to those who hold a diploma recognised by a registering body emanating from a federation of chemical organisations.

As a simplified classification which is capable of further subdivision in each group we suggest:—

(1) *Chemists.*—Graduates or recognised equivalent status—*i.e.*, on the lines of A.R.I.C. or B.A.C. full member qualification.

(2) *Chemical Assistants.*—Chemical assistants and those engaged in chemical process work requiring a lower standard of knowledge than Grade I, and equivalent to B.A.C. associate members.

(3) *Laboratory Technicians.*—Laboratory assistants of various grades to be defined under separate schedule.

GAS PRODUCTION AND THE CHEMICAL INDUSTRY—II

by Dr. J. S. van AKEN

COKE-OVEN gas of pure quality is excellent for various industrial applications. One type of gas, however, will not be sufficient to meet all requirements, which sometimes differ very much. For one application a hot but short flame may be desired, and for another the flame must be long and luminous.

As a rule the chemical industry is only interested in those components of the gas which are highly reactive and from which chemical products can be derived. Consequently, only the hydrogen and the ethylene are extracted.

In order to separate these gases from the coke-oven gas, additional purification is needed In doing so, carbon dioxide, as well as traces of naphthalene, benzol, toluol and various unsaturated hydrocarbons present are completely eliminated. This thoroughly-cleaned gas is separated into a number of fractions. Not all of these fractions are utilised by the chemical industry. Some two-thirds of the heat available in the coke-oven gas is still present in the residual gas, which has a calorific value higher than that of the original coke-oven gas. Considerable quantities of these residual gases are available.

In the internal gas economy of the two big combines now existing in Holland, and consisting of collieries, blast furnaces, steelworks, rolling mills, power stations and chemical works, the outstanding qualities of the residual gas have been readily recognised so that this gas has found wide application in those works.

But why should the utilisation of this gas be restricted to these industries only, seeing that in other sectors of industry the gas could be used to better advantage?

Gaseous Fuels and Gases

In searching for the best way in which the limited coal resources can be utilised for our national economy, many possibilities are here offered. If the gas-consuming industries could specify the characteristics of the gaseous fuels required, while at the same time the chemical industry would indicate to the consumer what are the possibilities, it may be feasible to secure a gas of the appropriate quality by making a choice of the available gas fractions, or by mixing them according to the require ments.

In Western Europe the period in which there was an abundance of fuel has ended. In those days it was neither necessary nor possible to find in the Netherlands a better use for coke-oven gas than for steam raising. Nowadays, however, there is a great shortage of gas.

By replacing the gas-fired steam boilers by boilers heated with coke breeze, and by heating the coke ovens with producer gas (*i.e.*, with coke) instead of coke-oven gas, and by other measures, practically all the gas produced could be placed at the disposal of the chemical industry and the public gas supply.

In carbonising coal, only part of the coal is converted into gas. Both the chemical industry and the public gas supply are demanding far more gas than can be obtained by carbonising the coal available which has the required properties. Since insufficient gas can be obtained by coal carbonisation, part of the coal available must be gasified.

Coke as Raw Material

In the Netherlands it has been decided not to use coke-oven gas any longer, but to use coke as the raw material for the future extension and development of the chemical industry. In this way the coal will be utilised to the best advantage, since in the primary carbonisation process the valuable products benzol, toluol and naphthalene are recovered, while in the secondary phase the coke is gasified, thus converting the coal completely into gas.

For the chemical industry it is a matter of importance to secure an extremely pure mixture of gases, which may otherwise be of a simple composition. Starting from various raw materials such as lignite, coke or coke-oven gas, the same final result can be obtained in the chemical industry. The public gas supply, however, makes totally different demands in this respect. Density, calorific value and combustion characteristics are some of the decisive factors, so that it is not always easy to use different raw materials to obtain a gas of which the above-mentioned properties do not vary. Hence, it was decided in Holland to apportion as much coke-oven gas as possible for the public supply, and to divert to the chemical industry another raw material, in this case coke.

Coke can be gasified either with steam and air, or with steam and oxygen. If steam and air are used, the process is discontinuous and a lower efficiency is obtained.

With oxygen, a continuous process is feasible in which the gasification is conducted at the highest state of efficiency. By continuous operating it is possible to maintain a constant temperature of reaction and to obtain a gas of the desired unvarying composition. These advantages are so evident that they overbalance the expenditure involved in producing the oxygen.

From a technical point of view it is not difficult to obtain a good gas for ammonia synthesis by the complete gasification of a solid fuel.

By gasifying coke it is far more difficult, however, to prepare a gas for the public supply equivalent to that hitherto delivered, since, as already mentioned, it must satisfy certain specifications as to density, calorific value and combustion characteristics. Yet, a scarcity of suitable coal and an ever-increasing demand for gas may rather soon make it necessary to adopt complete gasification for public gas supply purposes also.

German Practice

In Germany, for instance, and for the same reasons, a process has been developed for the complete gasification of coal. In this process, oxygen is used in order to obtain a gas sufficiently similar to that hitherto delivered to the public supply. In underground coal gasification, also, a gas of proper composition and an adequate efficiency can be reached only if oxygen is available. All this suggests that the preparation of oxygen will play a notable part in the future production of gas.

Fortunately, in recent years the practice of oxygen production has been considerably improved. At present, not only are bigger units built, resulting in smaller capital investment and operating expenses, but they also work at lower pressures, by which the energy required for the production of oxygen is considerably reduced.

In modern methods the air is compressed only to 5 atmospheres, for which only 0.40 kW is required per cu. m. of oxygen, whereas conventional processes require compression to 25 atmospheres and even to 60 atmospheres, the consumption of energy being 0.80 and even 1.15 kW. Nowadays, oxygen can be produced so cheaply that it is justifiable to use it in the gasification process. The fact that the chemical industry is beginning to use oxygen for the production of synthesis gas necessitates a mastery of this technique. Undoubtedly, the knowledge and experience acquired therein will also be of use for the public gas supply, when the change-over to complete gasification becomes necessary.

This paper may have given the impression that the entire public gas requirements should be supplied by some big industrial combine. The public gas supply would then be linked to the coke-oven plants and the chemical industry. That, however, is unlikely. It would be advisable, nevertheless, to arrange as far as possible that the gas produced by those industries should be placed at the disposal of the public supply. The gas required by municipalities and industries exceeds the quantity which the combine plants can deliver. Consequently, gasworks, the sole or principal aim of which is to provide for the public gas supply, will always be needed. The gas should preferably be produced by the carbonisation of coal, either by converting coking coal into metallurgical coke, or gas coal into gas coke.

It will depend on the availability of coking coal and gas coal in the European market whether these works are built as coke-oven plants carbonising coking coal, or as gasworks using gas coal as a raw material.

If it should appear that an inadequate quantity of both coking coal and gas coke will be available, then part of the gas should be produced by complete gasification.

In most of the gasworks only part of the hydrocarbons, benzol, toluol, etc., are recovered from the gas. In recent years the need for hydrocarbons in our national economy has been gradually increasing. The plastics industry, especially, requires ever-increasing quantities of these products. A future shortage of these raw materials can be foreseen, and preparation of aromatic from aliphatic hydrocarbons has already been considered.

Most gasworks produce a quality of gas unsuitable for industrial purposes on account of its varying composition. Many gasworks have in addition to their coal carbonising installation a water-gas or a carburetted water-gas plant. When in winter consumption increases, the percentage of water-gas is raised. It is impossible, of course, to obtain a gas of unvarying composition in this way. In consequence, it can be easily understood that this gas has practically no chance of industrial application, whereas 50 to 60 per cent of the coke-oven gas is consumed by industry, apart from the enormous quantities used by the industrial combines themselves.

Hydrocarbon Recovery Incomplete

The recovery of hydrocarbons at several gasworks—many of them small ones—is incomplete, so that the gas they deliver is not particularly suitable for application in the major industries. There is every reason for not continuing on the same lines. Industrial expansion, especially in the direction of the manufacture of high-quality articles, is a matter of absolute necessity for the Netherlands.

The gas industry, too, can contribute to the creation of favourable conditions, economic and technical, for other sections of industry. Consequently, the future production of gas should be carried out in big manufacturing units. Since the gas is delivered under pressure, it is logical also

(*Concluded on page* 464)

Chemically Modified Wood

MANY questions of interest to chemists are discussed in an article on "Chemically Modified Wood" written by Professor Edwin C. Jahn in honour of the 60th birthday of Professor E. Hägglund, the well-known cellulose-chemist, in the September 15 issue of the Swedish journal *Svensk Pappers Tidning.*

Professor Jahn, who is professor of Forest Chemistry in the New York State College of Forestry at Syracuse University, after surveying the recent literature on the modification of wood, comes to the conclusion that although our knowledge of the chemistry of modification of cellulose is slowly accumulating, much fundamental work remains to be done before satisfactory processes are developed for making wood plastics or structural board from comminuted wood.

Both the physical and chemical properties of wood and cellulose may be altered by various chemical treatments, he points out. Cellulose undergoes a large number of chemical reactions resulting in cellulose products of widely differing properties. The products formed may be (1) clearly defined cellulose derivatives such as the cellulose esters and ethers, (2) addition compounds or molecular complexes of a more or less unstable nature, such as alkali, ammonia and amine cellulose, cuprammonium complexes, addition compounds with inorganic acids, quaternary ammonium bases and others, (?) compounds resulting from the alteration of some of the functional groups of cellulose, such as the oxidation of the primary hydroxyls to carboxyl groups by nitrogen dioxide or the secondary hydroxyls to dialdehyde groupings by periodic acid, and (4) cross-linked cellulose chains bridged by the introduction of groups which attach to adjacent chains.

Technology Undeveloped

The technology of modifying the properties of wood, Professor Jahn notes, has not advanced to the same degree as it has with cellulose, despite the fact that wood has certain undesirable properties, such as dimensional instability, which need improvement. Wood, being a complex mixture of substances, does not enter into well-defined chemical reactions.

The morphological and colloidal structure of wood tissue is such that the constituents of wood are not easily separated even as derivatives. The cellulosan hemi-celluloses are intimately associated with the cellulose and difficult to separate, yet when once removed, the cellulosans are soluble in dilute alkali and the remaining cellulose is crystallographically more perfect. Microchemical studies also show that lignin and cellulose are intimately associated in the secondary cell wall, forming a finely interpenetrating system. Furthermore, there is considerable indirect evidence that the polyuronide hemicelluloses are chemically combined with lignin.

These considerations, points out the author, make it understandable why wood does not behave as a simple mixture of its components as we know them in their separate isolated forms. Furthermore, wood, when esterified or etherified, does not behave as a simple mixture of its component derivatives.

Comparison with Cellulose

Referring to the modification of cellulose, it is noted that the preparation of selected cellulose derivatives gives desired solubility and other characteristics permitting the spinning of filaments, the casting of films and plastics, the formation of lacquers, and the development of a number of other industrial uses. Physical changes are also brought about by chemical treatment, the best example being the mercerisation of textiles by strong caustic soda solution, and the parchmentisation of paper by concentrated acids or zinc chloride solution.

After many attempts to bring about cross-linking between cellulose chains to increase the wet strength of rayon and of paper, it has been found that formaldehyde is the reagent which gives the best results, and this is now applied to rayon industrially. The reaction between formaldehyde and cellulose is an acetal type of reaction in that it involves an aldehyde group and two hydroxyl groups.

Among other work on cross-linking appears a patent claiming that wood pulp with 12-14 per cent of beta and gamma celluloses (soluble in mercerising strength caustic soda solution) is rendered entirely alkali insoluble by formaldehyde treatment. Should this work be verified, the author comments, it would indicate that the short hemi-cellulose (cellulosan) chains may be linked together by methylene bridges through condensation with formaldehyde to form larger molecular particles.

Professor Jahn states that methyl and other ether groups can be readily introduced into wood in appreciable amounts. Methylated beechwood has been prepared with 39.4 per cent methoxyl and spruce with 40 per cent methoxyl. Wood, he adds, may also be methylated with diazomethane indicating that acidic groups, *i.e.*, carboxyl, phenolic or enolic groups, are present in the wood.

A number of other "wood ethers" have been prepared including the ethyl, hydroethyl and benzyl ethers. All of these products retain the appearance of the original wood. A characteristic property of the wood ethers, points out Professor Jahn, is their relative insolubility in organic solvents. This has made them of little commercial interest.

"Wood esters" can likewise be prepared by the usual esterifying agents. The acyl derivatives, like the "wood ethers," retain the appearance of the original wood and are insoluble or only slightly soluble in common organic solvents.

On the other hand a nitrated wood may be prepared which is over 90 per cent soluble in acetone. Under suitable nitrating conditions (10 to 13 parts by weight of water to 100 parts acid nitrating liquor at 18°-0° C.) woody tissues may be nitrated with little degradation, giving products in high yields which contain 10-11 per cent ester nitrogen. When slightly dampened with acetone or other solvents or swelling agents, the material may be moulded directly or mixed with compatible plasticisers such as camphor, and moulded. The nitrated wood is similar in its properties to nitrocellulose and is as easily worked into plastics, films, lacquers, etc.

The acetylation of wood has been studied by a number of investigators. A single acetylation by acetic anhydride with sulphuric acid as a catalyst gave an acetylated pinewood with 41 per cent and an acetylated beechwood with 42.2 per cent acetyl groups. Various other esters, such as the butyrate and benzoate have also been prepared.

Wood as a Plastic

Discussing the question of wood as a plastic and for use in moulded products, Professor Jahn states that water and heat increase the natural plasticity of the wood, the water acting as a plasticiser. Comminuted wood may be formed into plastic products by (1) acid hydrolysis, (2) thermal processes and (3) chemical condensation processes.

The first method involves partial or complete hydrolysis of the cellulosic part of the tissue, leaving a ligneous residue suitable for making lignin plastics. The second method involves the use of high temperatures and pressures. When untreated wood is heated and pressed at relatively high temperatures (200-250° C.) there is sufficient plastic flow to permit coalescence of the wood particles to form dense products of considerable strength. This is the basis of a successful industrial process for making fuel briquettes from wood wastes, which has been in continuous operation for over 15 years.

The third method, chemical condensations or reactions with wood to produce plastics has received much study but no suitable industrial process has yet been developed. In one process sawdust or agricultural wastes are digested at 11.35 kg. per sq. cm. for three hours with aniline and water. A lignin-aniline complex results and some hydrolysis of the carbohydrates takes place. Furfural is recommended as a plasticiser.

Among methods to improve dimensional stability, Professor Jahn mentions surface coatings or pore sealers (paints, oils and waxes) to retard the movement of moisture into the wood substance, and impregnation with water-repellant substances, such as paraffin or other waxes, to retard shrinkage. Latest research, however, is along the lines of controlling or interfering with the mechanism of the swelling-shrinking cycle. Three techniques have been developed (1) bulking effect, to keep swollen wood at approximately its swollen dimensions by introduction of non-volatile substances such as sugars and salts; (2) cross-linking, to reduce the number of hydroxyl groups together with simultaneous bridging by non hydroscopic linkages between molecular chains and structural units, and (3) plastic flow, by pressing wood under conditions of heat and pressure which cause plastic flow, presumably of the lignin.

The Moisture Problem

The disadvantages of the first method—impregnating wood by aqueous solutions of very hygroscopic materials such as sugars, zinc chloride, etc., is that the wood is always moist. Other substances for impregnating are waxes and water-soluble phenol-formaldehyde intermediates which give good results as the molecules of the latter are sufficiently small to permit good penetration. Furthermore they exhibit an affinity for wood by the fact that their aqueous solutions cause wood to swell beyond its normal green dimension. A number of commercial phenol-formaldehyde resinoids have been tested and found satisfactory, but because of the difficulty in getting complete and uniform penetration on large pieces of wood, the resin treatment of wood is considered practical only for veneers and plywood.

Concluding, Professor Jahn points out that a survey of some of the recent literature on the modification of wood indicates that despite the imperfect knowledge of the mechanisms involved, some technical advance has been made. Some of the developed processes reduce the undesirable hygroscopic property of wood and improve certain other properties. Some modified wood products are now being produced for special uses.

Our knowledge of the chemistry of the modification of cellulose, he adds, is slowly accumulating.

OBITUARY

Dr. Harry Thornton Calvert, chemical inspector and director of water polution research to the Ministry of Health, has died at Herne Hill at the age of 61.

CHARCOAL PRODUCTION IN BRITAIN

Modernised Methods to Supply Rising Demands

BECAUSE of current shortages, of materials and currency alike, continued development is anticipated in the British charcoal producing industry which war-time needs had raised to a higher state of efficiency than it had enjoyed possibly for a century or more.

Shortage of foreign currency is now reproducing in part the conditions imposed during the war when accustomed imports from Canada and the Scandinavian countries were either severely limited or terminated. Stringency of the fuel situation is another factor tending to confer added importance on the charcoal industry, and now the widespread withholding of petrol seems likely to encourage fresh demands on its output for the producer gas units which helped to relieve some of our war-time transport problems.

From the point of view of the chemical and smelting industries, charcoal is an essential raw material, with an increasing number of uses.

The Canadian charcoal producers, who since the war have been anxious to revive their English market which they are in a very good position to supply, if currency was available here, initiated a detailed survey of English production capacity, an informative piece of market research given publicity in the Canadian *Commercial Intelligence Journal*. Much of this report is of equal, or greater, interest here, especially in the present exigency.

Increased production and improved methods by which special grades of charcoal are being produced for specific chemical and allied processes are the keynotes of the industry in its revised form.

Change in the Kilns

The Home Timber Production Department of the Timber Control, which had charge of charcoal production since the early stages of the war, reports that the design of the portable steel kilns has remained substantially the same, the chief change being that these are now made in two sections instead of three as formerly. It has been found that this change has little effect on portability, while manufacturing is considerably simplified, and one source of potential air-leaks is eliminated. Other minor modifications include re-designed flue-boxes and flue-pipes of sturdier construction and bottom-sections reinforced at the base with steel of double thickness and vertical T-section ribs.

In the New Forest, where installations are of a more permanent nature than usual, producers have experimented with lining the kilns with firebricks. This has the advantage of prolonging the life of the kiln almost indefinitely, but the cost is high and it has been found that radiation from the bricks prolongs the cooling period to an undesirable extent.

A change which has proved successful is the construction of a special concrete base for the kilns, which permits of their being emptied from the outside. A trap in the base is covered with a steel tray during the loading, burning and cooling processes and when the kiln is ready for emptying, the tray is withdrawn and the charcoal bagged up with long-handled rakes and shovels. The job is much less unpleasant for the workmen and the crushing of the charcoal into dust is avoided. It is, however, an economic measure only when the kilns are to remain on one site for a fairly long period.

Lay-out of Batteries

The layout of batteries has been standardised, in the light of experience, as follows:

The kilns are arranged in a straight line, some 10 to 12 ft. apart, with a track (either of rails or sleepers) running the whole length, so that the saw bench can be moved up to the kiln being loaded. On the other side of this track the cordwood is stacked; this is handed down in the length to the man at the saw, cut into lengths of about 18 in., and thrown straight into the kiln.

On the far side of the kilns is another track on which the charcoal is loaded on to bogies after bagging and run into the storage shed. The latter is so located that from its far side the charcoal can be loaded direct on a lorry standing on the hard road.

An exception to this standard layout has been made in the case of a battery operating in Huntingdonshire. This is a 100 per cent charcoal operation in a stand of several hundred acres of birch, and is the biggest and most ambitious of the charcoal projects.

In this case the trees are cross-cut to a convenient length in the woods, and the lengths are brought in by rail to a miniature mill and put through a slasher which has five circular saws mounted 9 in. apart on one spindle. The billets are fed automatically by a belt conveyor from the slasher into trucks run on a rail track raised some 4 ft. off the ground, on either side of which is a row of fifteen kilns.

Due to the raising of the rail track (which considerably reduces the effort required to load the kilns) and to the fact that the kilns can be emptied from the outside, it has been found that women can undertake these jobs satisfactorily.

No important changes have been made, or called for, in the original technique of burning. Each burner has his own theories on such points as whether the charge should be lit at the top or bottom or midway, the duration of the warming-up period, the setting of dampers, etc., and as a general rule it has been found most satisfactory to allow them to follow their own bents in these respects.

Experiments have been carried out to ascertain whether any advantage could be gained by stacking the wood in the kilns and by grading it according to size, but it has been found that this has an adverse effect on output, owing to the extra time required for loading.

Yields per kiln vary considerably, owing to local conditions and such factors as species of wood, wetness or dryness of the wood, and efficiency of tending. Yields of over 15 cwt. have been obtained, but the average is probably between 10 and 12 cwt. from a kiln-load of about three tons of wood. Since each kiln is usually burned twice a week the yield is in the neighbourhood of one ton per kiln weekly.

Values have increased very largely above pre-war levels, at which Scandinavian charcoal was readily available at about £6 per ton ex-quality. Today some granulated grades realise up to £30 per ton.

Special Grades of Charcoal

One of the chief war-time developments was the production, after much experimental work, of a special grade of charcoal suitable for the manufacture of carbon bisulphide. For this purpose only certain selected species of wood are suitable (principally beech, birch, chestnut and hornbeam), and the charcoal has to be screened to eliminate all material below half an inch in size. For this process there was devised a motor-driven screening machine with a cyclone fan to extract the dust, and in some of the smaller operations ordinary potato-grinding machines, with slight adaptations, are being used successfully.

The demand for softwood charcoal is limited, but five or six tons of charcoal made from pine and larch are produced each week to special order. This is used in conjunction with acetylene to form a porous mass for navigational lighting.

The charcoal employed during the war for producer gas units was graded to a size-range of 3/16 to 1¼ in., and on the whole it was found that the species suitable for making carbon bisulphide gave better results than, say, oak, as they have less tendency to break down into dust in the hopper.

Fairly satisfactory results were obtained with these lorries, particularly after a cyclone fan had been fitted to extract dust from the gas on its way from the hopper to the engine.

ITALIAN CHEMICAL JOTTINGS

(*From our Italian Correspondent*)

OUTPUT of Portland cement in Italy exceeded 350,000 metric tons during August. This is an increase over previous months, and is due to the improvement in coal supplies, which, if they are maintained, will enable the production of cement in Italy soon to reach the pre-war figure. Despite the reported extra 50,000 tons of cement on the market during August, demands still exceeded supplies.

* * *

The products of the Italian ink industry continued to be produced in amounts sufficient for the country's needs. Great strides have been made in improving the quality of inks, especially as work in this direction is now unhampered by German competition.

The output of printing and other special inks is also adequate and in this connection it is interesting to note that numerous requests for printing inks are reaching Italy from South American countries.

* * *

Italian soap manufacturers are gradually increasing their production, though very little is being accomplished in the way of exports. This can be explained by the fact that they have always been obliged to import a great deal of the fats they need, and especially palm and coconut oils as well as some potassic salts and colophony. In 1939, for instance, the Italian soap industry consumed about 1,700,000 metric tons of fats, 830,000 tons of which were imported and the rest supplied by animal products of the country and residues from the olive oil industry.

It has been expected that imports of industrial fats would reach about 60 per cent of the pre-war figure this year, but in reality only small quantities arrived and the industry has had to rely on 36,000 tons of local fats. This is the more aggravating as Italian soap plants are capable of giving maximum outputs, not having suffered very much damage during the war.

* * *

The 59,000 tons of industrial fats which were assigned to Italy by I.E.F.C. but not collected owing to the shortage of currency with which to pay for them, have not been lost but incorporated in a new assignment. The problem of finding money to pay for copra, China wood, and oils, however, which Italy is to import from Dutch Indies, India, China, U.S.A., and other countries, still remains unsolved. Representatives of private firms are striving to induce the Government to leave the solution of this problem to private importers. The Government is reluctant to do this for it may influence prices unfavourably. In the meantime a number of applications for import licences have been filed.

Synthetic Phenol and Chlorobenzene

German Processes Fully Described

THE Office of Technical Services of the United States Department of Commerce has just released a report covering a comparative study of three processes used in Germany for manufacturing synthetic phenol and a description of the manufacture of chlorobenzene at I.G. Farben plants. Only the chlorination and sulphonation processes were used in Germany for large scale phenol production, the report states. The Raschig process was used early in the war on a pilot plant scale only.

Of the two major processes, the chlorination is regarded as the simpler and more direct. In this benzene is chlorinated to produce chlorobenzene which is then hydrolysed to phenol with aqueous sodium hydroxide at high pressures and temperatures. The process as carried out at I.G. Farben's Leverkusen plant is fully described in the report in the fullest detail.

Higher Yields

In the second major process, sulphonation, also studied at Leverkusen, benzene sulphonic acid is treated with excess 100 per cent sulphuric acid and fused with sodium hydroxide at high temperatures in open pans to give phenol. This process is the classical one, and its economy largely depends on the market demand for sodium sulphite, the by-product of the process. Although yields are higher than from the chlorination process and operating costs lower, the process is more complex and requires more floor space.

The following phases of the sulphonation process are discussed: sulphonation, sulphite treatment, neutralisation with calcium carbonate, evaporation and drying, fusion, recovery of sodium sulphite, treatment with sodium bicarbonate, carbonation, crude phenol treatment, extraction, phenol distillation, operating data, and apparatus.

The report discloses that the Raschig plant at Ludwigshafen, where the Raschig process was developed, has been completely destroyed by Allied bombing. Moreover, the plant had shut down in 1942 after having been compelled for a time to produce synthetic phenol for the government at a loss. The maximum output of the pilot plant had been about four and a half tons a day.

In the Raschig process, chlorobenzene was made by the catalytic reaction of hydrogen chloride, benzene, and air. The chlorobenzene was subsequently hydrolysed at high temperatures by steam in the presence of a catalyst, producing phenol and regenerating the hydrogen chloride. The process involves two reactions, each of which operates at a low conversion per pass. It is the most efficient of the three processes in the consumption of raw materials, but involves serious corrosion problems. Chlorination, hydrolysis of chlorobenzene, and operating data connected with the Raschig process are discussed in the report.

Continuous Production

The investigators also studied a continuous process for making chlorobenzene at the I.G. Farben Hoechst plant and a batch method process at the Leverkusen plant: Most chlorobenzene production was by the batch method but the continuous method was more efficient since it had the advantage of a very simple type of construction which eliminated internal coolers in the reactors and required less floor space. A defect of the continuous process is that the ratio of production of chlorobenzene to dichlorobenzene is low. This was no disadvantage providing there was a market demand for dichlorobenzene. Both processes are fully described in the report, No. PB-76032: *Phenol Manufacture in Germany*, 64 pp., including eight drawings, available in photostat form at $5 and in microfilm at $2 from the Office of Technical Services, U.S. Department of Commerce, Washington 25 D.C.

BUSINESS EFFICIENCY EXHIBITION

The Business Efficiency Exhibition, which, as announced in THE CHEMICAL AGE a fortnight ago can be seen at Olympia from October 1 to 11, has been opened by Sir Stafford Cripps.

Commenting upon the fact that nine years have elapsed since the last exhibition was held, the organisers—Office Appliance Trades Association—emphasise that they are aware that a new generation has now entered industry and commerce, and that "the juniors of 1938 are the managers of today."

OFFICIAL NOTICES

By an amendment of the Maximum Prices Order, manufacturers who print P.V.C. sheeting which they do not themselves calendar are now entitled to receive a margin of 14.29 per cent on cost (12.5 per cent on returns). The cost of processing (embossing, moulding, pressing, perforating, etc., may now be included in calculating maximum prices. The changes are detailed in P.V.C. Sheeting (Maximum Prices) (Amendment) Order (S. R. & O., 1947, No. 2059—H.M.S.O. 1d.).

Indian Chemical Needs

Inadequate Home Production of Essentials

THE domestic sodium and potassium meta-bisulphate industry has failed in its application for Government protection from outside competition. The Indian Tariff Board, reporting on the application, has expressed the view that the industry in India does not fulfil the first requirement—that it should be established on sound business lines. The Government decided to accept the report and to remove existing import restrictions.

Caustic Soda Outlook

The annual consumption of caustic soda in India during the pre-war years was 20,000 to 25,000 tons. During the war the demand for this product increased more than two-fold, roughly about 55,000 tons. With the anticipated development of rayon, hydrogenated oils, paper and pulp, and soap industries, during the ensuing years of rapid industrialisation, it is expected that the consumption of caustic soda would reach 120,000 to 150,000 tons a year.

Against this possible consumption, India's productive capacity is very low at present. Leaving out the cases of plants attached as auxiliary units to some of the paper factories in the country, the total annual production capacity of caustic soda plants in India is about 6000 tons of electrolytic caustic soda and an equal amount of causticised caustic. The present annual total production of caustic soda is 12,600 tons, as against the total consumption of 54,000 tons. The rest is being imported.

New Plants

There has been intense activity in India for the last two years for putting up additional plants to increase caustic soda products. Taking into account three leased plants, the licences already granted for the plants in Bombay and one in Mysore State and the permission acccorded to one of the present manufacturers in South India to duplicate the capacity, the future estimated capacity of all the plants would be about 24,000 tons. This still falls considerably short of India's annual requirements.

Chlorine has been used in India only for disinfection, sanitation purposes, and textiles. With the development of paper manufacture, the consumption of chlorine for pulp bleaching has been on the increase, but a number of paper factories have their own arrangements for generating the chlorine required. The imports of chlorine, both free as liquid chlorine and in the form of bleaching powder, have been estimated at about 10,000 to 12,000 tons.

It may be expected that with the founding of more paper factories, textile mills, etc., consumpion would soon be doubled, bringing the total consumption in India to about 20,000 to 25,000 tons. In addition, the demand for chlorine for the manufacture of organic chlorine compounds, principally DDT, Gammexane and chlorinated solvents, may be expected to consume an equal amount.

Taking all things into consideration, the estimated annual chlorine consumption in India during the coming years may be reckoned at about 45,000 to 50,000 tons.

Ammonium Sulphate

The production of ammonium sulphate in India in 1945-46 at 21,000 tons was less than the average of 25,800 tons for the war period but higher than the pre-war figure of 15,000 tons. The provisional figure of production of sulphuric acid also at 480,600 cwt. showed a downward trend as compared with the average of 815,000 cwt. for the war period of 512,000 cwt. in 1938-39.

The fall in the production of ammonium sulphate continued in the first nine months of 1946-47 also when production was 16,100 tons, 800 tons less than in the previous year.

GAS PRODUCTION

(continued from page 457)

to adopt a high-pressure purification process, by which the by-products are recovered in a complete and inexpensive way.

Seeing that in the future the large units will be interconnected and, at the same time, integrated with the existing coke-oven plants, it will be possible to attain a production in all these plants of a gas of similar quality.

The fluctuations in consumption due to seasonal changes, which as far as the domestic consumption is concerned seem to be unavoidable, can be smoothed by a combination of industries merely by adjustments of the internal gas distribution, changes which can be effected either by making a smaller quantity of producer gas, or by temporary increase of the consumption of coke-oven gas by the power station department.

The security of an uninterrupted delivery of gas for public supply under all conditions has been largely enhanced in a very economical way, namely, by connecting this gas supply with these big industrial combinations which themselves consume huge quantities of gas.

Metallurgical Section

Published the first Saturday in the month

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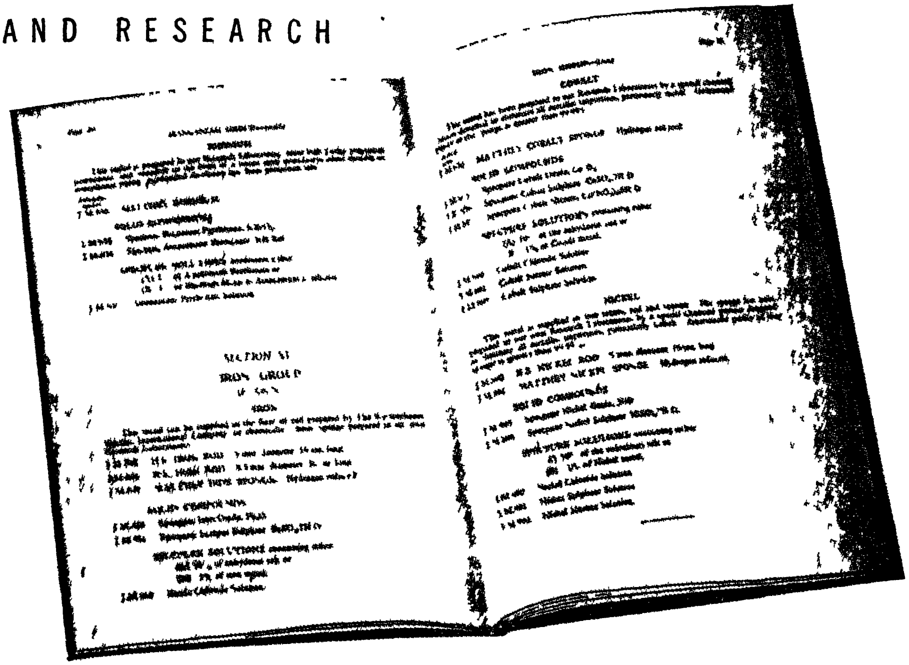

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Metallurgical Section

4 October 1947

WASTE PICKLE CONVERSION TO NEW MATERIAL

by WILLIAM BULL

THE processing of steel plant spent acid pickling liquor in order to secure concurrently economic and innocuous disposal presents a renewed challenge to metallurgical ingenuity, especially at these times when industrial efficiency is the only effective counter to cumulative national stringency. Most of the disposal methods involving conversion into commercial products, such as oxide pigments and polishing compounds, copperas, or chlorinated copperas for treatment of water or as a flocculating agency in sewage disposal, are handicapped through relatively restricted markets.

Certain other disposal methods involving chemical reaction with coke gas products, including ammonium sulphate, iron hydroxide, sulphide or carbonate, which prior to 1939 were receiving parallel attention in Britain and on the Ruhr, are in a different category as their manufacture involves costly specialisation in plant and carefully controlled processing. The regenerative processes whereby ferrous sulphate mixed with pulverised low volatile coal (I.G. Farbenindustrie or Clarkson-Fersul process) where through catalysis and controlled temperature iron oxide plus sulphur trioxide is utilised for production of sulphuric acid and smelting oxide are also in a different class economically. The capital costs involved predicate continuous operation and large-scale production.

Urgency of building, rebuilding and conversion within the United Kingdom lends special interest to a sulphuric (or hydrochloric) pickle liquor disposal method developed recently by which a cellular insulating building construction material is produced. The material, named " Ferron," can be produced at the rate of five tons dry product for each ton quicklime, which is the only significant raw material required in processing dilute spent pickling liquors or acid wash liquors. This method is in commercial scale operation at the Sharon Steel Corporation Plant, Pennsylvania. The Corporation was the first company to adopt the process and owing to satisfactory results the scale of production has been progressively increased to plant capacity, and the writer is indebted to Mr. C. W. Weesner, consulting metallurgical engineer to the Corporation, for details of its working and economy. The material is being dispatched from the Sharon Plant to consumers for purposes ranging from boiler and thermal service insulation, domestic and general building construction or sound proofing, and as a clarifying agent for hydrocarbon solvents and lubricating oils. Calculations, which apply to the U.S.A., indicate that a field for around 7500 tons daily output exists. Undoubtedly, if steel companies in the United Kingdom disposed of their surplus pickling liquors under this system the tonnage output would assume very important proportions in shape of fireproof, cellular wallboard, hollow tiles and lighter-than-clay products, raw moulding material for switchboards. insulating material for refrigeration plant or ship interior material at a favourable cost relative to present high costs of standard building materials.

Ferron is relatively inert, non-corrosive and combines 50 per cent air pores or air cavity constitution; it lends itself excellently to working by ordinary tools, takes wood screws or nails with facility; the material is not friable nor easily damaged during building work, and it may be waterproofed with sodium silicate or by coating with a varnish. It allies itself satisfactorily to cement or concrete. Results at Sharon are with pickle liquor at 26 per cent $FeSO_4 + 7H_2O$ and 6 per cent H_2SO_4, that is, 5.3 per cent iron and 6 per cent acid = 37 lb. of Ferron from 10 gallons pickle; this according to a simple working formula used by the company and expressed as " the amount of Ferron in pounds that 10 gallons of this pickle liquor will make equals the per cent acid by weight times 1.75, plus the per cent iron by weight times five."

What is new about the process is not primarily the lime-liquor reaction, which is $FeSO_4 + H_2SO_4 + nH_2O + 2Ca(OH)_2 \rightarrow 2CaSO_4.2H_2O + Fe(OH)_2 + (n-2)H_2O$, but the mechanical and thermal processing leading to creation of a utilisable raw material. The process at Sharon has been modified, in the light of progressive production, from a batch process to more or less continuous production by automatic precipitators, continuous driers and so forth, and the main charges are for quick-lime at the rate of one ton per five tons dry Ferron and fuel costs, for gas in this case, for tunnel drying operations.

Movement of Liquor

From the main pickle reservoir with a capacity of several days' production release, the liquor is pumped into 2000-gallon agitating tanks and there processed with milk of lime. The crushed rock quicklime is moved by auto-hoist from rail trucks into an elevated steel bin and thence by gravity feed to a 1500-gallon mixing tank for slaking. The pickle is added to the agitator tanks, together with small amounts of fibrous material—pulped newsprint, for instance—and the mix is diluted to a point where iron sulphate is 5 per cent and acid content 2 per cent, a dilution essential for securing satisfactory reaction and acid wash water may be added to depress strength without disadvantage. Milk of lime is added during agitation up to complete neutralisation point, precipitation of iron then being complete in form of hydroxide. At this processing point a quick rise in *p*H is denoted and checked by contacting a slurry sample with phenolphthalein-moistened paper, bright red colour denoting completion of reaction.

Final Processes

The agitated slurry is now pumped, via plunger type pumps, to pressure filters. The slurry readily pumps and filters, but high pressure is necessary to secure reduction of moisture content to around 50 per cent. The firm consistency press-cakes then resulting are fed through a clay pug mill, the pounded mass being subsequently extruded on to travelling steel trays. The loaded trays, racked three deep, are processed through a gas-heated tunnel drier. Here the 50 per cent residual moisture is evaporated, the material sets and oxidises, forming a product of high porosity. Total production costs, including labour and power, are estimated at around £1 per ton of product, this representing disposal of 500 gallons spent pickle.

The following comparative figures for insulating properties of the resultant Ferron are expressed as B.Th.U. per hour per sq. ft., 1 in. thickness and in degrees Fahrenheit:—

Materials	
Ferron	.55
Asbestos sheet	1.05
Building brick	4.80
Fireclay brick	8.40
Plaster	3.00
Gypsum (made up)	3.00
Cork	.30
85 per cent Magnesia insulation	.47
Concrete	5.28
Breeze concrete	2.40
White pine timber	1.04

Ferron will withstand temperatures up to 900° F. and when admixed with clay to 50 per cent up to 2000° F., considerably above organic insulating material levels. Its insulating capacity is estimated to be 5½ times greater than standard plaster or gypsum-rock building wall-board and is 2 to 1 favourable in comparison with average timber. The residual effluent, by analysis, possesses no oxygen absorptive character and it will increase *p*H of streams at discharge site; its contents are calcium hydroxide, calcium sulphate and sodium chloride, in that order. The water is, however, too hard for use in plant.

Dilution of Liquor

Further details of practical interest denote that the conjoint precipitation of calcium sulphate and ferrous hydroxide produce a composition termed "ferroxy-calcium sulphate" of a character distinct from its separate components. It is said that, in practice, a very wide dilution of liquor is permissible as long as the ratio of precipitate is 10 per cent ferrous hydroxide, remainder being calcium sulphate, and that conditions will vary in individual steel plants without affecting final results, if controlled according to whether the processing is by continuous pickling of strip with up to 7 per cent acid, whether stainless or alloy steels are processed, or on quantity of acid wash water for disposal. Ferron may be satisfactorily precipitated at atmospheric temperature, but is more complete at 70° C. Cost of the installation at Sharon was around £23,000 and the Ferron product is saleable as non-hygroscopic wall-boards, or building construction panels at $10.00 per thousand board feet.

The experience of Mr. R. J. Wean, president, Wean Engineering Co., Inc., the company mainly responsible for construction of Ferron plants, is that unit requirements vary among steel plants, that power consumption at filter press location is relatively heavy and that improvements are in hand on this problem. The aim is to make standard unit plants, and blueprints have been made of standardised designs to handle 5000, 10,000 and 50,000 gallons daily.

USE OF SPONGE IRON IN STEEL PRODUCTION

Report of Investigations

A 74-page report by the United States Bureau of Mines, richly furnished with data, figures, tables and references, on the use of sponge iron in steel production has just been released.

The investigators come to the conclusion that sponge iron can be used to replace a portion of the scrap iron normally employed in the production of steel. The maximum percentage of sponge iron that can be substituted without requiring an appreciable change in furnace operation or without reducing furnace capacity depends on the grade of the sponge iron, the type of furnace employed, and the operating procedure.

The physical properties of steel made with some sponge iron in the furnace charge were as good as those of steel made with normal raw materials. They were processed without difficulties by the usual procedures.

Oxidation During Storage

It was found that sponge iron oxidises readily when stored outdoors for extended periods during rainy weather. The tests demonstrated that such oxidation interferes with the effective utilisation of sponge iron as a melting stock in steel production. Consequently it should preferably be used within a few days after receipt or stored under cover.

Well-produced sponge iron in the form of slabs with low sulphur (0.014 per cent), phosphorus (0.008 per cent), and silica (1.5 per cent) contents was found to be very satisfactory when used to the extent of 50 per cent of the charge in electric furnaces making high quality steel.

Sponge iron with a relatively high silicon content (6.5 to 7 per cent) made from blast furnace grade ore without a special concentration was used as 25 per cent of the furnace charge at one plant and 32 per cent at another. The heats were satisfactory, but the slag volume was abnormally large because of the high gangue content of the sponge iron. Both the plants employed a two-slag practice; that is, the oxidising slag was removed after melt-down and then constituents were added to form the reducing slag. When this grade of high-silicon sponge iron was used with single-slag practice, it appeared that about 15 per cent sponge iron in the charge was the maximum amount that would give satisfactory operation.

Granular sponge iron was used as 18 per cent of the furnace charge at one plant. The only difficulty experienced was the sticking of a small amount of the sponge iron to the walls. If the granular sponge iron is loaded so that it is in the centre of the charge, it should be a satisfactory raw material for basic electric furnaces. Granular sponge iron has a low density, but if properly charged it would flow into the voids between scrap and, therefore, the use of moderate percentage of granular sponge iron should decrease the volume occupied by a furnace charge. At some plants the use of granular sponge iron might avoid the necessity for charging more than once and thereby possibly decrease the operating time.

Acid electric furnaces are generally used in the production of steel castings for which it is often desirable to have metal low in sulphur and phosphorus, but neither of these elements is removed with an acid slag. Therefore the investigators were interested in the possibility of producing castings with low sulphur and phosphorus content by using sponge iron as a portion of the charge. For sponge iron to be a desirable melting stock for acid electric furnaces, it should be low in sulphur and phosphorus (below 0.02 per cent for each element). Data on only a few tests were obtained in acid electric furnaces, for which sponge iron constituted one-quarter to one-half of the charge. In these tests, reactions between the iron oxide of the sponge iron and the carbon in the bath appeared to cause more trouble than in basic electric furnace tests, indicating the need for a well-reduced sponge iron in acid electric practice. However, this difficulty could possibly be overcome through the development of the proper charge composition and loading procedure. In these tests the slag volume was somewhat greater than for normal operation. This caused no trouble in the furnace but was undesirable in the ladle during the casting operations. This disadvantage could probably be overcome through a change in the operating procedure, such as the removal of part of the slag during the progress of the heat.

Sponge Iron Slabs

Sponge iron slabs with a high silicon content (about 7 per cent) were used to replace scrap in a basic open-hearth charge to the extent of about 12 per cent of a cold-metal furnace charge without any appreciable change in operating procedure or reduction in furnace capacity. No tests were made with a higher percentage of sponge iron of this grade, as an excessive slag volume would have resulted from the high silicon content of the sponge iron.

Sponge iron slabs made from mill scale with a lower silicon content (2 to 3 per cent) were used to replace scrap to the extent of 20 per cent of the furnace charge. These heats melted lower in carbon than the regular heats at the plant, which indicates that the proportion of pig iron or carbonaceous material in the charge should be increased over that normally employed. In other respects, this percentage of sponge iron in the furnace charge caused no operating difficulties. From the furnace tests it would appear that the slabs of sponge iron should preferably be charged on top of scrap and then covered with additional scrap to prevent oxidation of the sponge iron by exposure to the heating flame.

Sponge iron made in the form of dense pellets in a rotary kiln was used as half of an open-hearth charge. The pellets were placed in piles on the bottom of the furnace, followed by hot metal after apparent fusion of the sponge iron. The heat required two hours longer than for normal operation, so it would appear that only superficial fusion of the pellets had occurred prior to the hot-metal addition. A change in operating procedure, such as the use of smaller amounts of sponge iron charged on top of scrap, would probably give more satisfactory results.

High-Quality Sponge

A high-quality sponge iron was used successfully as 20 per cent of an acid open hearth charge at another plant. Sponge iron with a relatively high silicon content (6.5 per cent) was employed as 13 per cent of an open-hearth charge without interfering with normal operation. However, the carbon and silicon content of the furnace charge should be increased above that used in normal operation to compensate for the iron oxide present in the sponge iron because of incomplete reduction and oxidation during melting. The reaction was generally favourable to the use of sponge iron low in sulphur and phosphorus.

The report points out that sponge iron processes warrant consideration as a means of alleviating a scrap shortage during a war or other national emergency. It can be made with equipment constructed for other purposes (brick plants, cement kilns), and therefore production could begin in a short time with only a small expenditure for minor changes in plant facilities. Possible higher production cost for sponge iron processes operating on a small scale, compard with blast furnaces, might be offset by the high cost and time required for new blast furnace construction.

The economic use of sponge iron as a raw material for general steel production in normal years depends on the development of processes for producing this material on a large scale at low cost. Such processes would appear most applicable to sections of the country that do not have coking coals suitable for blast furnaces but do have ores and reducing agents satisfactory for sponge iron production. In the present stage of development of sponge iron processes, it appears economically feasible to produce a high-purity material on a relatively small scale for use in the manufacture of special steels in electric furnaces.

Chrome Ore and Concentrates

The Ministry of Supply announces that new selling prices for chrome ore (see table below) which include carriage charges to nearest rail point consumers' works, are to apply as from October 1, 1947. The prices are an increase of 2s. per ton ex ship, and 4s. per ton ex store, with the exception of the prices of the Turkish ores which are new importations into Britain.

Grades	Per ton ex ship			Per ton ex store		
	£	s.	d.	£	s.	d.
Refractory:						
Rhodesian imperial grade	9	14	6	10	14	0
Transvaal 1st grade ..	7	19	6	8	19	0
Sierra Leone	9	12	0	10	11	6
Phillippine	8	12	0	9	11	6
Indian...	9	4	6	10	4	0
Turkish " A " grade ...	9	14	6	10	14	0
Turkish (grade 1)	9	18	6	10	18	0
Metallurgical:						
Rhodesian washed concentrates	9	17	0	10	16	6
Rhodesian lumpy metallurgical	9	17	0	10	16	6
Baluchistan	10	2	0	11	1	6
Chemical:						
Rhodesian dyke chemical ...	9	17	0	10	16	6
Transvaal chemical XL concentrates	9	19	6	10	19	0
Transvaal " A " grade concentrates	9	9	6	10	9	0
Baluchistan	10	2	0	11	1	6
Indian...	9	19	6	10	19	0

Low Melting Alloy

Instead of waiting from six to eight weeks for small experimental steel dies to be made, research engineers of the Ford Motor Company have developed a new alloy which speeds the production of their experimental dies. This metal, an alloy of bismuth, tin and lead, is ordinarily too soft to stand the tremendous pressures imposed on dies. They have overcome this obstacle by freezing the die in liquid nitrogen, which produces a Fahrenheit temperature of 320 degrees below zero. This freezing action confers a tremendous surface hardness. From six to ten samplings can be secured between chillings in the frigid bath. Thus, instead of waiting from six to eight weeks for small steel dies, the soft metal dies are produced and sample parts obtained in 24 to 48 hours.

Oxygen Steel Production

THE technique of using oxygen is now being further developed in the steel industry to promote chemical reactions in the open-hearth process of steelmaking and to speed up the production of steel, according to a statement by the American Iron and Steel Institute.

"Oxygen is one of the commonest of all elements but its progress as a general industrial tool has been comparatively slow as against some other, rarer elements," states the Institute.

"For many years the cost of commercially pure oxygen was a barrier to its increased use. Technical papers on the possibilities of this type of oxygen in steelmaking were presented before the Institute at least as early as 1920 when several experts formerly discussed this subject. Although still in the development stage, the use of manufactured oxygen in steelmaking is far beyond the stage of experimentation. Full-scale commercial use now depends largely on the speed with which economical oxygen-producing plants can be built adjacent to steelmaking furnaces Several oxygen-manufacturing plants are now under construction, and it is reported they will produce a gas of 90 per cent purity at about $7 per ton.

"Commercial oxygen is used in the manufacture of open hearth steel in two different ways. One use of it is to enrichen the open hearth flame to speed up the melt down period. This use of oxygen is based on the fact that the oxygen enriched flame is hotter than the conventional flame and so reduces solid scrap and limestone to liquid metal and slag very rapidly. The flame temperature reached in ordinary open hearth practice is about 3300°F. while temperatures of 500°F. higher or more are attained by the use of oxygen, depending upon methods of use. This hotter flame is achieved with 10 to 25 per cent reduction in fuel and with little or no damage to refractory materials, inasmuch as the maximum temperature prevails for only a few minutes under present practice."

Tin Metal Allocations

The Ministry of Supply announces the following additional interim allocations (in long tons) of tin metal by the Combined Tin Committee for the second half of 1947: Ceylon, 18; Egypt, 34; Finland, 22; Ireland, 18; Palestine, 66; New Zealand, 129; Jugoslavia, 116; Australia, 150.

These allocations are additional to those announced on July 8 and 22, and on August 21.

The 29th annual National Metal Congress and Exposition will be held in Chicago for seven days beginning October 18, 1947.

Use of Sintered Ore

STEEL is lacking to-day because raw materials for charging the furnaces are in short supply. To produce ninety million tons of steel annually, U.S. manufacturers use a hundred million tons of raw materials of which 35 per cent is scrap. Twenty per cent of this comes from the fabricating plants, leaving a balance of 15 million tons a year to be acquired outside the industry. The maximum capacity of furnace production cannot be used to-day because of a shortage of scrap, and as a result, American geologists are advocating an expansion of capacity to produce sintered ore or concentrate as a way out of the difficulty.

The following are some of the advantages said to accrue from the use of sinter as a substitute. Lump ore, of whatever quantity and quality, is not necessarily indispensible to furnace charges. Scrap requirements could be halved, and sufficient supplies obtained within the steel plant itself. Large quantities of sinter could be produced in plants constructed quickly and inexpensively, and low-grade Mesabi ores could keep the steel furnaces indefinitely supplied. No drastic steel plant conversion would be necessary, since the steel industry has had long familiarity with the characteristics of Mesabi ores. Light sinter could be made for the blast furnace, and heavy sinter for the open hearth. Limestone flux could be pre-mixed with sinter feed thus obviating the time and expense of preparing blast furnace charges.

Beneficiation of the low-grade taconites—their concentrates will have to be sintered before charging to the furnace—will materially increase iron ore reserves for some time to come. The supply of the taconite is such that it is said to be capable of meeting the needs of the industry for more than 100 years, while beneficiation of these valuable ores will not only maintain America's steel production but at the same time effectively and permanently resolve scrap shortages.

Foundry Output Increase

Mr. James Ernest Smethurst, head of the firm of James Smethurst & Sons, engineers, iron and brass founders, Warrington, one of the oldest foundries in the country (established in 1785), stated that output had increased by 26 per cent during the last two months, and would have been higher but for the stoppage of coal in the early part of the year.

Employees work under the contract price system which has had beneficial results on output and, in addition, unskilled workers have been trained in plate moulding. Production would be further increased if the workers had concessions with regard to the payment of income tax and overtime, said Mr. Smethurst.

WELDING STANDARDS

THE October issue of *Welding Research*, which is published in conjunction with the *Transactions of the Institute of Welding*, will contain two papers dealing with "Recommendations for the Design, Fabrication and Erection of Metal Arc Welded Mild Steel Building Structures" and "The Photographic Aspects of the Radiography of Welded High-Pressure Vessels," by Mr. L. Mullins.

The first paper comprises recommendations prepared by the British Welding Research Association from a detailed survey of present practice. The work was undertaken with two principal objects in view: the provision, at the request of the Institution of Structural Engineers, of clauses for inclusion in the Welded Steel Construction section of the code prepared by the Institution for the Codes of Practice Committee for Civil Engineering, Public Works and Building; second, the preparation for the British Standards Institution of recommendations on which to base a revision of B.S. 538-1940, "Metal Arc Welding in Mild Steel as applied to General Building Construction."

The second paper is complementary to the "Recommendations for the Standardisation of the Radiographic Examination of Welded Joints in Mild Steel Pressure Vessels" which appeared in the journal's August issue.

GERMANY FOOD INDUSTRY

AN exhibition of photographs, drawings and specimens, obtained in Germany by B.I.O.S. investigating teams sponsored by the Ministry of Food, will be on view in the Conference Hall, Portman Court, Portman Square, W.1, from October 15 to 29, between the hours of 10 a.m. and 4 p.m.

The following are among the informal talks to be given in the exhibition at 3 p.m.: Thursday, October 16—"German Soapless Detergents," by Mr. G. R. Perdue; Wednesday, October 22—"Food Preservation and Refrigeration in Germany," by Dr. E. C. Bate-Smith

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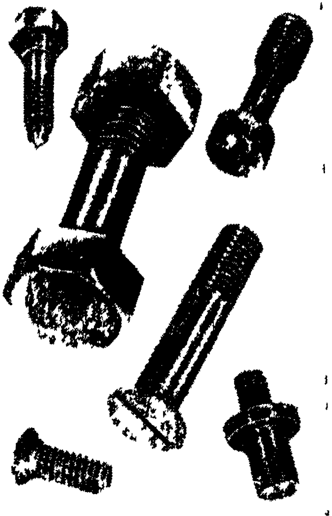

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ATOMIC ENERGY

British Reports Released

A SECOND list of 25 reports from the Government's secret files on atomic energy and related subjects has just been released by the Ministry of Supply. The first list, containing 73 reports, was released in March this year, and an address was given from which copies might be obtained on loan by interested responsible workers.

A change has been made, however, in the method of making the reports available to the scientific public, and copies will now be sold by H.M. Stationery Office, P.O. Box 569, Cornwall House, London, S.E.1, to whom application should be made for reports from either list. It will be necessary only to quote the B.D.D.A. number in the present list, but titles should be quoted in the case of the previous list unless the B.D.D.A. number is known. These reports are in the form of enlarged prints taken from micro-films, and the prices below are for these prints; as an alternative, films could be supplied if desired. The copyright of all such documents is vested in the Crown, and copies may not be made, nor extracts published, without the permission from H.M.S.O.

It is hoped that H.M.S.O. will also be in a position shortly to supply documents of American origin on atomic energy, and applications for these should be made to the address given above. These arrangements do not affect the method by which Canadian documents are obtained from the Plans and Publications Section of the National Research Council, Ottawa.

The British documents newly classified are as follows:

B.D.D.A. No.	Report No.	Title and Author(s)	Date	Price £	s.	d.
74	Br.195	Report on experimental work on fluorine production to May, 1939. Thomson, J. W.	8/6/39		10	8
75	Br.50	Investigations on oxides of X*. Haworth, W. N.	c.Nov., 1941		1	4
76	Br.257	A new method of investigating the angular distribution of high-energy neutrons, scattered by protons Feather, N.	27/3/42		4	0
77	Br.37	The preparation of fluorine. Ferguson, J.	22/5/42		10	8
78	Br.72	Capture cross-sections of N, Mg, S, Ca and Pb for thermal neutrons. Fenning, F. W., Seligman, H.	Nov., 1942		2	0
79	Br.89	Note on the inelastic scattering of fast neutrons. Feather, N	14/11/42		3	4
80	Br.310	Neutron-produced radioactivity in relation to the detection of high-energy neutrons: maximum sensitivity of a Counter. Feather, N.	26/11/42		2	0
81	MS.13	Equilibrium time in a separation plant. Peierls, R.	—		8	0
82	MS.15	Effect of a stationary layer of thickness h in front of the diffusing membrane. Peierls, R.	—			8
83	MS.17	Separating effect of a passage through capillary. Peierls, R	—		2	0
84	MS.21	Effect of boundary layer for swept membranes. Fuchs, K			8	8
85	MS.39	Clusius-Dickel device as gland. Peierls, R.			4	0
86	MS.P.2A (Revised version of MSP.2)	Critical conditions in neutron multiplication. Pryce, M. H. L			2	8
87	MS.85	Effect of a scattering container on the critical radius and time constant. Fuchs, K.			10	0
88	Br.106	Preparation of metallic X* by electrolysis of the fused salts. Haworth, W. N.			1	4
89	Br.199	The "Metalectric" furnace (with sketch). Tomlinson (Metalectric Co., Ltd.). Haworth, W. N.	-		2	0
90	MS.88	Note on the compression at the diffuser entry in compressor I.Z.I. Friedlander, F. G.	recd. July, 1943		6	0
91	Br.393	Density of resonance neutrons in hydrogeneous media near the source. Booker, D. V., Broda, E., Kowarski, L.	Jan., 1944		14	8
92	Br 448	Receiving time and counting errors in discriminators and scaling units. Cranshaw, T. E.	18/1/44		10	8
93	Br.391	Distribution of slow neutrons in rarefied hydrogeneous media. Kowarski, L., West, D.	Feb. 1944		16	8
94	Br.469	The determination of X* in urine. A proposed modification and some notes on the method. Jones, A. G.	3/8/44		2	8
95	MS 115	A new method of determining the time constant of a sphere in a container. Wilson, A. H.	16/8/44		6	0
96	BI.68	Extraction of protactinium from a silicaceous raw material. Broda, E., Wright, P. K.	March, 1946		2	0
97	MS.12A (Revised version)	Separation of isotopes. Peierls, R., Fuchs, K.	25/2/47		10	0
98	Br.732a (Revised version of Br.732)	The spectrographic analysis of uranium. Walsh, A.	March, 1947		10	0

* Uranium

LEATHER CHEMISTS' CONFERENCE

Support for Widened Research

THE greatly widened field which chemists have developed in the service of the leather industry was reflected by the paper presented at the recent annual general meeting in Leeds of the International Society of Leather Trades Chemists, British Section. The international interest in the meeting was shown by the attendance of a number of overseas delegates, including M M. Queroix, Vignon and Comte, of the French Society of Leather Trades Chemists, and Mr. A. E. Norton, treasurer of Australian Section, who were welcomed by Mr. F. H. Quinn.

The president awarded the Donald Burton Prize for 1947 to Mr. K. Mclaren for his paper entitled "Investigations into the Degreasing of Sheepskins," and in doing so paid a tribute to Dr. Burton for his work in connection with the British Section.

Research Levy Suggested

The need for continued fundamental research by chemists freed to devote themselves exclusively to the work was stressed in a paper by Mr. G. W. Odey on "Industrial Research," in the course of which tribute was paid to the great advances brought about through the pioneer work of Sir Robert Pickard, the late Dorothy Jordan Lloyd and the late Prof. H. R. Procter. The speaker emphasised that industrial research on a big scale was more than ever necessary in order that British industry should compete in export trade with the U.S.A., in which country industrial research had made enormous strides. Research could not be done "on the cheap." It demanded the best brains. With regard to organisation in the leather industry, some form of co-ordinating body linking up with trade federations, research associations and the Export Corporation was favoured. Mention was made of the stimulus already given by this latter body, including financial grants. Finance for research, the speaker suggested, might be supplied through a compulsory levy. The opportunities for progress were enormous and they required more money than any system of voluntary contribution was likely to provide.

The following technical papers were presented in the course of the meetings: "Research in the Tannins of Sumach and Mimosa" (K. S. Kirby and S. N. Catravas); "The Proteins of Muscle Fibril" (Kenneth Bailey); "Some Aspects of Complex Formation in Basic Chromium Sulphate Solutions" (D. A. Plant); "Recent Developments in the Control of the Vegetable Tanning Process" (M. P. Balfe); and "Some Day-to-Day Chemical Engineering Problems in the Leather Industry (G. W. Douglas).

LINSEED SUBSTITUTE NEGLECTED

Rubber Seed Could Relieve Shortage

THE shortage of linseed oil could be substantially relieved if a determined effort were made to bring to this country the very large stocks of rubber seed which are available in Malaya and Ceylon. This fact was confirmed by Dr. L. A. Jordan, director of the Teddington Paint Research Station, in a statement to THE CHEMICAL AGE. While no exact figures existed, said Dr. Jordan, it was probable there were available some half-million tons of rubber seed in S.E. Asia which might be capable of affording about 25 per cent of that quantity of oil, which for some purposes would be an efficient substitute for linseed, with a solvent value of about 140.

New Method

A deterrent to the wider use of rubber seed in the past had been the deterioration brought about in the seed by enzyme action. It has now been established, however, that this can be arrested if the seed is dried at 100°C. The principal difficulty now, he said, was to initiate any effective action towards the large-scale collection of this valuable raw material which could make a useful contribution towards solving the current difficulties of paint manufacturers.

There were, Dr. Jordan emphasised, some objections to any attempt to substitute rubber seed for linseed as a long-term policy, among them being the comparatively high costs of collection resulting from the rising costs of coolie labour and the changing methods of cultivation, encouraging the growth of cover crops in the rubber plantations. He agreed, however, that in view of the high level of linseed oil prices and the world shortages there was no excuse for neglecting the rubber seed stocks which could now be readily secured.

Control of Chemists

AT the time of going to press the position of the industrial chemist in relation to the new Control of Engagement Order is no less obscure than it was a week ago. Although the "clarifying list," to which reference was made in our issue of September 26, has since become available, the time-honoured profession of chemistry is regrettably omitted. In an endeavour, therefore, to seek a clear ruling, THE CHEMICAL AGE has made last-minute inquiries of the Ministry of Labour. Their reply is to the effect that the position of the qualified chemist in industry is still under consideration, and that his and other professions similarly unclarified may form the subject of a press conference at the Ministry soon.

FRENCH OILS AND FATS

WORK OF THE NEW RESEARCH CENTRE

IN France, as elsewhere, the vital importance of oils and fats in world economy to-day has long been realised, and the new research centre in Paris (Inst. de Recherches pour les Huiles de Palme et Oléagineux) with the active support of the Government, especially the Colonial Ministry, is vigorously pursuing its task of collating existing information and opening up fresh fields of research. While collaborating with the old-established Inst. Colonial de Marseille, whose *Bulletin des Matières Grasses* it has taken over and publishes under the new name *Oléagineux,* it nevertheless undertakes a large and progressive programme of its own in oils and fats technology, economics, and trade. In recent months it has devoted considerable attention to the ambitious schemes of the Colonial Ministry, through the Commission de Modernisation, for increasing oils and fats production in the French African colonial territories and at home; but it evidently aims to cover the whole vast field of oils and fats technology, from the scientific cultivation of oil plants and trees to the intricate chemistry and physics of the fatty products. Some results have been already published, and the following is a brief summary taken from *Oléagineux* during the first half of 1947. (References are to months and pages.)

Soil Studies

In the first of a series of studies of tropical soils, with special reference to oil plant culture, Professor H. Erhart (June, 293-303), a pioneer in pedological science, deals with those of the Sudan and Madagascar to illustrate more particularly the nature of lateritic clays and other formations. In the virgin forest area of eastern Madagascar several zones or horizons overlying the original granite or gneiss are distinguished. Alteration of this original mother rock has resulted for the most part in lateritic clays which have lost much if not all their alkaline or alkaline earth bases, K, Na, Ca, and Mg, as well as most of the Si. The tropical conditions under which this and other changes take place, and the nature of these changes, with particular referencce to the red soils of Madagascar are discussed; the earlier work of Perrier de la Bathie in his book 'Vegetation Malgache" and the phyto-geographic studies of Professor Humbert are also noted.

In the Great Island as elsewhere there has been much deforestation by fire or otherwise and consequent denudation of soils except where protected to some extent by the great ravines or lavakas. The red soils or lateritic clays are more or less typical of the forest or pre-forest areas of French tropical Africa, and where denuded, are of doubtful fertility. Careful soil surveys are obviously necessary before any grandiose schemes of oil-plant cultivation are initiated. The author concludes this first part of his studies with an account of the so-called podzols and Orstein soils, including samples from Madagascar, the Sudan, and the Middle Niger. Some fine illustrations accompany the text. (See also P. Michaux on soil surveys for oil-palms—Feb., 82-3.)

Oil-Palm Physiology

Under the heading "Floral Biology of Palm Trees," P. Henry, chief botanist at the Institute, describes the physiology of the various palms: oil palm, coconut palm, date palm, and others, including numerous illustrations. (May, 233-241.) The subject may be sub-divided into (1) morphology of the floral organs; (2) distribution of sexes; and (3) pollination, with its physico-chemical aspects, and the part played by natural agents such as wind and insects.

M. Ferrand, Director of the Research Centre, bases the greater part of his discourse on "Culture of the Oil Palm," on experience gained in the Far East (Malaya and Sumatra) and in the Belgian Congo. (Jan., 1-10.) On the east coast of Sumatra the area under oil-palm cultivation has increased from 4000 hectares in 1918 to 104,000 hectares in 1940. Although soil and climate in the East are said to be much more favourable than in Africa, scientific culture on the plantation system has been the most important factor. Yields of oil (presumably palm oil and excluding kernels) after the eighth or ninth years attained 1½ to 2 tons per hectare but these declined for a time through various disquieting causes during 1920-24, and a thorough study was made of cultural conditions, especially nitrogen intake and need for organic matter in the soil. As a result, yields began once more to increase. Special study was made of fertiliser requirements, and also of plant selection. The best fertiliser mixture per palm was found to be 2 kilos ammonium sulphate, 2 kilos basic slag, and 1 kilo concentrated (48 per cent. K_2O) potassium chloride. In these soils of the Far East, potash is not usually lacking and may often be omitted from the fertiliser programme. Under favourable conditions and after careful selection the yields on some plantations, after 8 to 10 years' growth, exceeded four tons of oil per hectare. Special attention has also been given to intercropping among the palms with cover crops in order, among other things, to maintain the nitrogen content of the oil and especially the carbon-nitrogen ratio. The results obtained in the East stimulated work on similar lines in the Belgian Congo and the establishment, in 1933, of the I.N.E.A.C. (Inst. Nat. pour l'Etude Agronomique du Congo Belge). By 1939, oil-palm culture under the plantation system was 60,000 h. of which about one-fourth was planted by the natives. And finally on the basis of all this work in Asia and Africa, the Institute in Paris (I.R.H.O.) has in hand a large programme of intensive research on oil-palm cultivation.

Oil-Palm Pests

Oil-palm pests are described by Th. F. Le Stanc, chief entomologist of the Institute. (Feb., 59-67.) They are mostly insects, but include also the palm kernel rat (rat palmiste) and a small bird, of the Weaver group (Tisserin). Insects of many kinds attack the oil-palm and are described in some detail together with appropriate insecticides for the different groups. So far as the plantations are concerned the best preventive is sound cultivation, pruning, weeding, and so forth; but this of course is less applicable in the native forests. Among the most effective chemical remedies are specified arsenic in some form or other, and derris root (rotenone). A formula commonly used in the East Indies comprises 0.3-0.4 per cent powdered derris, titrating 10 per cent rotenone, together with 1-2 per cent talc.

H. Pech and P. Henry (March, 139-143) give a brief account of experimental work on accelerated germination of oil-palm seeds at the Pobé Station in Dahomey, in which a small hot-house of special type was used, at fairly constant temperature of 35°-40°C. and saturated atmosphere. The interesting fact emerges that by periodical exposure to lower temperature, say down to about 25°, by placing the seed-boxes outside in the shade, rate and extent of germination was considerably augmented. In one case a 98.2 per cent germination was attained. Experiments are being continued to determine definitely the optimum conditions.

In an article on the "Autoxidation of Fatty Acids (mono-ethylenic) and their methyl esters by Ch. Paquot (Jan., 15-19) work on this subject is reviewed.

Professor J. J. Trillat, writing on "X-Rays in the Study of Fats (Part I, Feb., 68-75) points out that advantage has been taken of the orientated crystallisation of fatty bodies to apply the methods of X-ray

(Continued from previous column)

diffraction to their investigation. In this first part of a paper read at the Institute in April, 1944, the author described the method of orientated layers and results thereof, including size and structure of molecules, structure of hydrocarbon chains, and treated in some detail normal hydrocarbons, normal fatty acids, their derivatives (soaps, etc.), polymorphism, mixtures, and the crystalline structure of fatty acids.

Polish Chemical Exports

POLISH chemical exports during July and August have included 700 tons ammonium, 300 tons sodium hydroxide, 145 tons calcium chloride and 300 tons sodium carbonate to Russia; 240 tons of zinc white to Norway, 220 tons to Sweden, 180 tons to Holland and 70 tons to Denmark. Hungary received 20 tons trichlorethylene; 2220 tons of tar were shipped to Yugoslavia, Switzerland and the Russion zone of Germany.

Oilfield output for August reached 11,170 tons of crude petroleum giving 5050 tons petrol after refining; natural gas production was 9,235,000 cubic metres. Recent expansion in natural gas production has been sufficiently great to render possible the commencement of a new pipe line being constructed between Debowice to Cieszyn (Tieschen) Lower Silesia.

Exploration for new oil fields in the areas north of the Tatra Mountains is officially said to be meeting with considerable success. New borings in the Province of Crakow have been particularly promising and there is every liklihood of considerable development in the course of the next few years.

NEW VARNISH PLANTS

One of the most modern and efficient varnish factories in the world has been officially opened in Montreal by the Sherwin Williams Company of Canada. Part of the company's $2,500,000 expansion programme, the plant is designed to produce alkyd-type resins used in the manufacture of modern varnishes for industrial, marine, aeroplane and maintenance finishes; vegetable oils and similar products will also be produced. The new factory, which is located near the company's office building in the city, is the largest of its kind in Canada, and contains equipment capable of producing 1,500,000 gallons of varnish per year; it is designed ultimately to reach a production of 3,000,000 gallons annually. Including its auxiliary units it occupies approximately two acres, and is one of the largest industrial consumers of gas in Montreal.

STREPTOMYCIN

The first commercial samples of streptomycin have been made by Boots Pure Drug Company in Nottingham The photographs on this page show the streptomycin plant, which has many points in common with the plant for the production of penicillin

1 Spores being introduced into the tanks for preliminary fermentation 2 Transferring Actinomyces mould to the main fermentation tanks 3 Some of the large fermentation tanks 4. Charcoal with absorbed streptomycin from filter presses being mixed with alcohol 5 The final product in a sterile powder form.

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COAL ALLOCATIONS BUNGLED

Effect on Coke Oven Plants

DISASTROUS consequences are bound to ensue if the National Coal Board differentiates in allocations of coal between gas supply undertakings and coke ovens that sell their gas to the gas industry. This is the view put forward by Col. W. Moncrieff Carr, O.B.E., T.D., managing director of the United Kingdom Gas Corporation, in a letter published by *The Times* last week.

Through such differentiation, Col. Carr recalls, hundreds of industrial firms in West Yorkshire were unnecessarily deprived of gas for a time during the recent dispute in the Yorkshire coalfield.

The consequent dislocation and loss of production arose through the announcement last week by the National Coal Board that all coke ovens in Yorkshire would be required to cut their throughput of coal by 45 per cent, irrespective of whether they sold their gas to gas undertakings or not.

Col. Carr suggests that those announcing the cut were not aware that coke ovens in many instances form to-day an integral and important part of the gas industry, especially in Yorkshire where a vast gas grid supplying 17 towns in the West Riding draws the bulk of its supplies from three coke ovens.

EXPLOSIVES INSPECTORS' REPORT

BECAUSE of the increasing use of acetylene under pressure in a range of industrial chemical processes, which were stimulated by work performed in Germany during the war by Dr. Reppe, special attention is paid in the newly-issued 1946 annual report of H.M. Inspectors of Explosives (H.M.S.O., 1s. net) to the risks involved in the uses of this source of plastics, textile fibres, and dye intermediates.

The inspectors have consulted with a number of firms employing acetylene under pressure, with the Association of British Chemical Manufacturers and the British Acetylene Association, and a new Order in Council has been drawn up under the Explosives Act, 1875, to regulate safety measures.

QUARRYMEN'S WAGES

Significant results of an unrestricted production scheme aided by an unlimited bonus structure are reported from Graseby, Lincolnshire, where at one of the principal lime quarries in the country, workers whose standard rate is only 1s. 10d. an hour have earned in some cases up to £20 in a week on a tonnage-bonus system. Many quarrymen regularly receive £14 in a week.

TO STUDY PROFIT MARGINS

New Committee Set Up

THE Board of Trade has now announced the constitution of the committee which, under the chairmanship of Mr. G. H. Lloyd Jacob, K.C., is to study the practice of resale price maintenance and the methods by which minimum wholesale and retail profit margins are fixed, "and to report whether, in the light of present conditions and particularly of the need for the maximum economy and efficiency in the production and distribution of goods, any measures are desirable to prevent or regulate its continuance."

Members of the committee will be: Mr. J. R. M. Brumwell, managing director and proprietor of the Stuart Advertising Agency; Dame Anne Loughlin, Trades Union Congress; Mr. John Ryan, M.C., vice-chairman of Metal Box Co., Ltd.; Mr. H. G. Sharp, formerly manager and actuary of the Scottish Widows' Fund and Life Assurance Society; Mr. Henry Smith, vice-principal of Ruskin College Oxford; Mr. R. E. Yeabsley, Hill Vellacott & Co., C.A., and Accountant Adviser to the Board of Trade.

FIRE PROTECTION

New Benn Journal

BENN Brothers, Ltd., Bouverie House, Fleet Street, London, publishers of THE CHEMICAL AGE, have acquired from Lomax Erskine & Co., Ltd., the proprietorship of the monthly journal *Fire Protection and Accident Prevention Review*, and of the *Fire Protection Year Book*. The October number of *Fire Protection* will be issued under the Benn imprint.

Founded in 1938 with an eye to the need for a wider diffusion of up-to-date technical knowledge of fire fighting, and to assist the fire service in its task of reorganising to meet the expected ordeal of heavy air raids, *Fire Protection* has become well established as a paper for officers of the N.F.S., industrialists, business men, local and national Government officials and works safety officers interested in the better protection of life and property from fire. To the task of providing information and guidance on fire prevention and fire fighting and the administration of fire services, it has, since the war, added that of furthering safety and accident prevention in industry at large.

Mr. Basil H. Tripp, a director of Ernest Benn, Ltd., who served in the auxiliary and National Fire Services from 1938 to 1945, has been appointed editor.

FATAL ACCIDENT WITH CYANIDE

Courageous action and presence of mind of Mr. D. W. Hivey, of the Hivey Fumigation Co., Cheapside, Liverpool, and of Mr. T. W. Clarke, a manager, mitigated the effect of an accident last week with cyanide gas at the company's store in which one workman lost his life. While the gas was being decanted from a 75-lb. cylinder an escape developed. One man received the full effects of the gas and staggered, blinded, into the back of the store. The other tried to reach the open air, but collapsed. Mr. Hivey and Mr. Clarke went to their help. After throwing the cylinder into a gas-tight chamber and shutting it off, they tried to reach the man in the back of the store. The fumes overcame Mr. Hivey, but Mr. Clarke managed to get both men into the fresh air. Other workers brought oxygen cylinders and masks from the office and gave oxygen to the three men, Mr. Hivey recovering sufficiently to direct operations. The supply of oxygen was maintained in the ambulance to the hospital, but on arrival one of the workmen was dead. The Hivey Fumigation Company are employed in fumigation work on board ships.

ELECTRON JUBILEE

In connection with celebrations marking the jubilee of the discovery of the electron by Sir J. J. Thomson at Cambridge in 1897, the Institute of Physics and the Physical Society, in collaboration with the Institution of Electrical Engineers have opened an exhibition at the Science Museum, South Kensington. It is to remain open for at least three months, and may be visited between the hours of 10 a.m. and 6 p.m. on weekdays and from 2.30 p.m. until 6 p.m. on Sundays.

Forming part of and in conjunction with the celebrations, Sir Clifford Paterson gave a lecture entitled "The Electron Liberated" on Thursday, September 25, at the Central Hall, Westminster.

Prices Too High

Addressing the 23rd ordinary general meeting of Geo. Cohen, Sons & Co., chemical engineers, in London last week, Mr. Cyril M. Cohen (chairman and managing director) said: "It seems that the prices of high-grade British engineering products are becoming less favourable when compared with their Belgian, Czechoslovakian, Italian and French equivalents, all of which are beginning to make themselves felt in export markets. British prices will have to be reduced if we are to keep our hold on the export trade and increase its volume, as is so imperative."

NEW METAL-DRYING LIQUID

Water Extraction

A thin, water-shedding liquid for drying metals is reported to have been produced in the U.S.A. The new liquid, which is described as "thin and mobile," is called "Hydrex," and is said to have a very high penetrating power to enable it to displace water from blind holes and crevices. The drying procedure consists of immersing the metal in the liquid where the water is automatically extracted. When this process is complete, the metal is removed. It is now covered with a thin film of solvent which quickly evaporates to leave a completely water-free surface with some rust-inhibiting properties.

The liquid has been used for the drying of plated work such as chrome, silver or cadmium which often exhibit corrosive tendencies with age. It also disposes of spots that normally remain on the work from solids dissolved in the water, such as chromic acid or from the solids in hard water. The water extracted from the metal by the new liquid sinks to the bottom where it can be drawn off periodically.

UNDERGROUND GASIFICATION

According to *The Times* Brussels correspondent, Belgian engineers have just returned from Italy where they conducted experiments in the underground production of gas.

The experiment was carried out in a lignite seam containing 55 per cent moisture and, in its dry state, 25 per cent ash. Gasification of the seam produced 7,000.000 cu. ft. of gas each day of 1000 calories per cu. ft., or about 24 cu. ft. of gas per lb. of raw lignite. In the opinion of the engineers, this result proves the scientific soundness of the making of gas underground as a new principle of mining practice, and they claim that it is applicable to peat as well as to coal and lignite.

New U.S. Cartel Conspiracy Alleged

Three leading United States glass manufacturing companies, *viz.*: Corning Glass Works, Corning, N.Y., the Owens-Corning Fiberglass Corporation and the Owens-Illinois Glass Co., both of Toledo, have been charged by the United States Department of Justice with conspiracy to dominate and to control the American fibre glass industry. They are, moreover, being accused of concluding cartel agreements with foreign manufacturers to strengthen their American monopoly position. The District Court is being requested to split up Owens Corning so as to establish competitive conditions in this industry.

Next Week's Events

MONDAY, OCTOBER 6

Society of Chemical Industry (London Section). Burlington House, Piccadilly, W.1, 6.30 p.m. Dr. J. W. Walker: "Synthetic Drugs in the Fight against Tropical Diseases."

TUESDAY, OCTOBER 7

Textile Institute (Bolton Branch). Municipal Technical College, Manchester Road, Bolton, 7.30 p.m. J. Shepherd: "British Export Trade under Post-War Conditions."

WEDNESDAY, OCTOBER 8

Fuel Luncheon Club. The Engineers' Club, Albert Square, Manchester, 12 noon. Opening meeting of the 3rd Annual Session. Mr. R. Alan S. Thwaites: "Staggering—and all That."

Society of Chemical Industry (Food Group). Burlington House, Piccadilly, W.1, 6 p.m. E. F. Gall: "Microbiological Proteins—their Synthesis, Production and Feeding Value." H. J. Bunker: "Production for Foodstuffs." J. A. B. Smith: "Production in the Rumen." R. Braude: "Food Value for Animals." B. S. Platt and R. A. Webb: "Use for Human Food."

Society of Chemical Industry (S. Wales Section). Physics and Chemistry Lecture Theatre, University College, Cathays Park, Cardiff, 7 p.m. H. W. Cremer: "Water—a National Asset." (Jubilee Memorial Lecture).

THURSDAY, OCTOBER 9

British Association of Chemists (Liverpool Section). Lecture Room, Radiant House, St. Helens, 7 p.m. T. C. Pickering: "Optical Glass."

Chemical Society (N. Wales Section). Lecture Room, Department of Chemistry, University College, Bangor, 4 p.m. Sir Ian Heilbron: "DDT and Gammexane in the Control of Insect-borne Diseases."

Oil and Colour Chemists Association. Lecture Theatre, The Royal Institution, 21 Albemarle Street, W.1, 6.30 p.m. Sir Lawrence W. Bragg: "A Review of Recent Advances in X-Ray Analysis."

Recent Progress in Geological Investigaions and Mineral Developments in the Colonies. Cinema Hall, Imperial Institute, South Kensington, S.W.7, 3 p.m. 8th Lecture. S. H. Shaw: "The Geology and Mineral Resources of Palestine."

Scottish Engineering Students Association. Institution of Engineers and Shipbuilders, Glasgow, 7.30 p.m. Sir James Lithgow: Presidential Address.

Chemical Society (Manchester Section). Chemistry Department, The University, Manchester. D. F. Fairbrother: "Inorganic Catalytic Halides."

(Continued at foot of next column)

STEEL PLAN FOR RHODESIA

WITH a view to commencing the large-scale production of steel, Sir Dennistoun Burney, acting on behalf of the Firth-Brown steel combine, is reported to have acquired a mineral concession in Northern Rhodesia from the British South Africa Company. The area thus obtained for prospecting is stated to be approximately five times the size of Wales; is said to contain many hundreds of millions of tons of iron ore, and will cost many millions of pounds to develop.

The richest deposits are believed to lie about 40 miles west of Lusaka, the Northern Rhodesian capital, and bordering the Zambesi river. Plans so far envisaged include the construction of a dam across the river at Kraiba Gorge, 300 miles distant from the Victoria Falls, for a hydro-electric project.

As far as is known, the concession, which has received official approval, will eventually lead to the erection of steel mills, and later to the associated production of chrome in Southern Rhodesia.

Brazil Needs Soda Ash

Brazilian industries are reported to need supplies of approximately 3500 tons of caustic soda and 3000 tons of soda ash monthly and are at present receiving only about 50 per cent of their requirements. Soap, glass and paper factories are particularly affected by the shortage which has been aggravated by the restriction on exports of these chemicals from the U.S.A. and the reduced production in the United Kingdom. It may be recalled, that earlier this year, the Federal Government announced that financial and technical aid was being obtained from the U.S.A. to set up a plant in Brazil to produce caustic soda and soda ash from local deposits of salt and lime.

(Continued from previous column)

FRIDAY, OCTOBER 10

The Fertiliser Society. Lecture Hall, Royal Society of Tropical Medicine and Hygiene, 26 Portland Place, W.1, 2.30 p.m. Sven Nordengren: "Granulation of Phosphatic Fertilisers—Theory and Practice."

Chemical Society. London and Southampton, University College Chemical Society. Physics Department, University College, Southampton, 5 p.m. C. C. Price: "The Influence of Substituents on the Polarity of the Benzene Ring."

SATURDAY, OCTOBER 11

Institution of Chemical Engineers (North-Western Branch). College of Technology, Manchester, 3 p.m. S. G. Terjesen: "Removal of Bacteria from Air by Filtration."

Technical Publications

A CONSIDERABLE increase in the number of accidents coinciding with the wider use of milling machines during the war is given as one of the reasons for the investigation by a technical advisory committee of additional safeguards with horizontal milling machines. One of the conclusions of this committee, now published (" The Safeguarding of Milling Machines," H.M.S.O., 1s. 6d. net), is that the existing standard of fencing provided by the Horizontal Milling Machine Regulations, 1928, is inadequate. The report describes and illustrates a variety of more effective guards.

* * *

A range of position controllers suitable for operating remote mechanisms over distances varying from a few yards up to a quarter of a mile has been developed by Evershed & Vignoles, Ltd., and is described and illustrated in a new publication (No. 220). Each controller comprises a hand-operated transmitter electrically connected to one or more distant electric motors. This method of control permits considerable flexibility in the location of plant, and overcomes limitations hitherto imposed by mechanically-operated controllers.

* * *

Booklet No. 88 in the " Foundry Practice " series issued by Foundry Services, Ltd., contains a great deal of valuable information, well illustrated, on a number of casting problems associated with a variety of metals, and especially aluminium and copper alloys.

* * *

The heavy duty refrigerating plant recently shown by Peter Brotherhood, Ltd., at the Marine and Engineering Exhibition, the vertical two-stage ammonia crosshead plant, is the subject of an illustrated technical review which the company has just issued. It should be of interest to all concerned with large-scale refrigeration, the plant itself being of the same design as four which are being supplied to a new oil refinery in the Middle East.

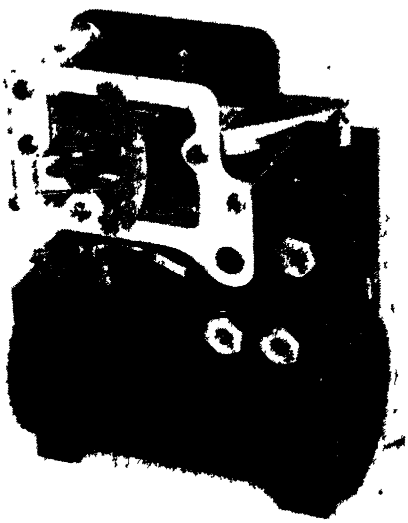
* * *

Great economies in the use of steel and a saving of possibly a million tons of coal a year could be made by the fuller use of welding for erecting steelwork structures. This estimate by the Director of Research, British Welding Research Association (Mr. A. Ramsay Moon) is recorded in the current issue of " The Welder " (Murex Welding Processes, Ltd.), which publishes several articles technically important to welders.

Further development of the technique of automatic control is seen in the new Type 2 photoelectric equipment described in a recent folder from Londex, Ltd. An important improvement is the instrument's immunity from variations of sensitivity arising from fluctuation of voltage in the mains. Changes between 150 and 270 v. do not impair its efficiency.

* * *

Another important advance in the same direction is represented by the air-operated automatic controller (Mark 20) newly issued by George Kent, Ltd., and fully described in literature now issued. Now available for use with the Kent ring balance meter, the temperature or pH control and the fluid, steam or gas flow meter, the control mechanism will detect a deviation of ±0.2 per cent.



Automatic Controller

* * *

Of interest to metallurgists is the Muirhead-Wigan decade oscillator newly released by Muirhead & Co., Ltd., who describe it in an illustrated brochure as their " highest achievement in this field." The claim is based largely on the very high accuracy of measurement of frequency steps, from 1 c/s. to 100 kc/s, of which the low frequencies are very usefully employed in vibration measurements.

Home News Items

Works Managers' Institution.—The Institution of Works Managers' has issued a programme of activities for its 1947-48 session. Copies are obtainable from the secretary, 2 Caxton Street, Westminster, S.W.1.

New Mining Machinery Ordered.—Orders for £9 millions of new mining machinery have been placed by the National Coal Board. It has been described by a Ministry of Supply spokesman as a first instalment in a mines modernisation programme that may take 14 or 15 years to complete.

Ironworks for Sale.—The " Globe " iron works, of the British and Colonial Horseshoe and Machine Co., Ltd., Walsall, which has gone into voluntary liquidation, are to be sold by auction at the Walsall Chamber of Commerce by Messrs. Belcher & Son, on October 7.

£7000 Gift from Monsanto.—Monsanto Chemicals, Ltd., have entered into an agreement with the University College of South Wales and Monmouthshire to pay the college £1000 for seven years to support a lectureship in plant physiology and botany.

Cement Prices.—Allegations that cement prices in the Liverpool area have risen disproportionately—6s. 6d. in two months and twice the pre-war figure "—were denied by a spokesman of the Cement Marketing Company in Liverpool. The present price, he said, was 79s. 6d. per ton. Pre-war cost, with bags, was 48s. ton, and two months ago it was 76s.

Cement Shortage in Liverpool.—Following reports emphasising the serious shortage of cement in the Liverpool area, a letter sent by the Ministry of Works to the National Federation of Building Trade Employers says: " In regard to the Liverpool situation the cement industry agree with us that, on any showing, Liverpool itself, as distinct from Lancashire, is probably not getting the cement it requires, and we have asked them to take immediate steps to remedy the situation."

Rising Prices.—The continued rise in wholesale prices of import and export goods in the past four months is shown by the publication in the *Board of Trade Journal* of the following index numbers of imports of raw material and un-manufactured articles: May, 268; June, 271; July, 282; August, 285. Equivalent index numbers for exports in the same category were: May, 226; June, 2227: July, 230; August, 235. Metal goods exports rose from 204 in May to 214 in August.

Montan Wax Extraction.—The British Lignite Company, Ltd., proposes to erect plant and buildings at Bovey Tracey, Devon, for extracting Montan wax from lignite. No objection has been raised by Newton Abbot Rural Council.

Visit to Evans Medical Factory.—Members of the West Lancashire and Cheshire Smoke Abatement Committee visited Evans Medical Supplies, Ltd., Speke factory, an September 22. They toured the factory, and Mr. C. M. Opie explained the method for disposing of chemical effluent and smoke.

U.K. Oil Search.—The D'Arcy Exploration Company has been granted licences to prospect 195 square miles in York, 197 square miles in Stirling, Dumbarton, Lanark, Westlothian and Midlothian, and 150 square miles in Stirling, Westlothian and Midlothian.

British Enterprise in Australia.—An exhibition attesting to the scope of industrial developments in Australia during the past two decades was opened by Sir Stafford Cripps at Australia House, Aldwych, W.C.2, this week. It is to remain open until October 25.

Objections to New Steelworks.—Because 170 residents have objected, the £7 million scheme for expansion of the John Lysaght, Ltd., steelworks at Normanby Park, Scunthorpe, has been made the subject of a public inquiry, at which the company's local chief engineer stated that the development was designed to raise the works steel output from 6500 tons to 12,000 tons weekly.

Deterioration of Penicillin.—Mr. Harry Brindle and Miss Winifred G. Keepe, of Manchester University Department of Pharmacy, stated in an address at the British Pharmaceutical Conference at Torquay, last week that nine out of ten samples of commercially available penicillin which they had examined had deteriorated and that the usual containers were unsatisfactory. There was gross absorption of moisture and 40 to 80 per cent of activity had been lost by samples in containers in less than six months.

Deeside Steel Project.—Dutch engineers are removing a huge sandbank in the River Dee at Connah's Quay and pumping thousands of tons of sand and shingle a distance of two miles a week to level a site for a new steel mill. This is part of the development programme revealed last December in connection with Summers' steel works, where it is hoped to raise the capacity of the plant to 500,000 tons of steel sheets a year. The present output is between 350,000 and 400,000 tons.

PERSONAL

Sir Frederick Bain, a deputy chairman of I.C.I., addressed the National Brassfounders' Association at the Grand Hotel, Birmingham, on Saturday last.

Mr. P. A. Wells, general secretary of the Society of Dyers and Colourists, has been appointed Director of Education in the International Wool Secretariat, London, as from October 1.

Dr. C. J. T. Cronshaw, a director of I.C.I., spoke at a luncheon which preceded the annual general meeting last week of the Purchasing Officers Association at the Connaught Rooms, London, W.C.

Mr. R. C. Stanley, president of the International Nickel Company of Canada, who has just been awarded the King's Medal, left this country in the *Queen Elizabeth* for New York last week.

Professor Marcus Oliphant, professor of physics at Birmingham University, has just returned from a four-day visit to Norway where he has been lecturing on the subject of atomic energy.

Mr. D. G. Hemmant, Powell Duffryn Technical Services, Ltd., has left this country for Borneo as leader of a team of mining experts which his company has sent to the Island to investigate coal deposits on behalf of the Colonial Office.

Mr. Michael Waugh, of Monsanto Chemicals rubber chemicals department, has received a presentation from his colleagues to commemorate the occasion of his recent wedding. During the war Mr. Waugh was an R.A.F. pilot.

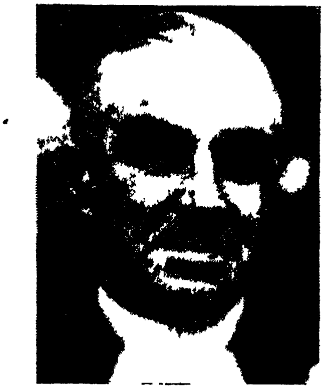
Capt. C. T. Turner, assistant analyst to the City of Liverpool, has retired after nearly 40 years in public analytical work. Mr. and Mrs. Turner were recently present at a farewell gathering in the City Laboratories, where they received presentations from Mr. J. F. Clark, the City Analyst.

Mr. D. Maxwell Buist, export director of British Electrical & Allied Manufacturers' Association, has recently returned from a trip to Vienna. His visit is understood to have been undertaken on behalf of the Board of Trade, to whom he has submitted a report on the subject of the prospects for British exports of electrical goods to Austria. Mr. Buist was formerly chief electrical engineer at the I.C.I. Billingham Works.

Mr. Geoffrey Hickson, a senior manager of B. Laporte, Ltd., and a director of their subsidiary companies—National Titanium Pigments, Ltd., Associated Phosphate Manufacturers, Ltd., and Malehurst Barytes Co., Ltd., is shortly leaving England to take an appointment as managing director of the Australian subsidiary—Crystal Laporte Proprietary, Ltd., Botany, N.S.W., and to act as general representative of the Laporte group. The Crystal Laporte plant for the manufacture of hydrogen peroxide is now undergoing extension.

The athletic distinction in the past of the president of the Monsanto Chemical Company, **Mr. William M. Rand**, was recalled when on holiday in England last week, he was host at Claridge's Hotel at a re-union of members of the English team with whom he competed in the 110 metres hurdles at the Olympic Games in 1908. His American team took first four places. Last week only three English competitors could be mustered and a goodwill cable was received from another in South Africa. Mr. Rand returned to the company's St. Louis headquarters last week-end.

Sir Frederick Wells, managing director of Sanitas, Ltd., as forecast in The Chemical Age of July 26, has been chosen to be the next Lord Mayor of London.



Sir Frederick Wells

Steel Company of Wales

The board of the Steel Company of Wales has appointed the following directors to executive positions: **Mr. R. Julian Pode**, managing director; **Captain H. Leighton Davies** assistant managing director; **Mr. W. F. Cartwright**, general manager (steel division); **Mr. T. O. Lewis**, general manager (tinplate division). The undertaking at Orbe Works, Newport, will be carried on as a wholly-owned subsidiary company to be named The Steel Co. of Wales (Lysaght Works), Ltd. The board of the latter company will be Sir Charles Bruce-Gardner, Bt., chairman; Mr. E. C. Lysaght, Mr. E. Julian Pode, Captain H. Leighton Davies, Mr. R. P. Perry.

Overseas News Items

Pharmaceutical Federation Meeting.—The 1949 general meeting of the International Pharmaceutical Federation is to be held at Brussels.

Telephone Number Change.—The telephone number of Messrs. Theodore St. Just and Co., Ltd., Whitefield, Manchester, has been changed to WHItefield 3211 (5 lines). Formerly Whitefield 2729.

New Du Pont Sulphuric Acid Plant.—The Grasselli department of the Du Pont de Nemours group has recently started operating the new sulphuric acid unit at the James River in Virginia.

Malayan Tin.—Shipments of tin from Malaya in August totalled 3180 tons, of which the U.S.A. received 1850 tons, Europe 600 tons and British Possessions 730 tons. Of the tin ore shipments of 432 tons Thailand received 296 tons and Burma 111 tons.

U.S. Steel for Near East.—The United States Department of Commerce on September 26 announced that it has approved an export licence for 20,000 tons of steel to the Trans-Arabian Pipeline Company on the grounds that Arabian oil will serve "American strategic, political and economic interests."

Alumina in Western Germany.—Production of alumina may recommence in the British Zone. The manufacture of aluminium and magnesium as well as alumina was originally to be prohibited, but it is understood that the Martins works at Bergheim, Cologne district, will now be permitted to produce at the rate of 5000 tons a month.

Development of Spanish Industry.—The progress of the Instituto Nacional de Industria (I.N.I.), a State-controlled holding concern formed to finance and develop Spanish industry, is reviewed in the Spanish Press. The activities of this institution are at present directed to (a) coal, iron and steel and other metal industries, and (b) oil, chemical, fertiliser and artificial fibre industries. It is stressed that a policy of nationalisation will not be followed.

Austrian Coal Deposit.—A new big brown-coal deposit, estimated at 24,000,000 tons, has been opened in Ostermiething and Wildshut, Upper Austria. A Four Years' Plan has already been drawn up aiming at a yearly production of 800,000 tons. It is calculated that after two years 40,000 tons, and after three years 400,000 tons could be mined. The new mine belongs to the Aluminium Trust of the firm Stern & Hafferl.

Synthetic Jewels in Germany. — The Karbidwerk Freyun, in the Bavarian Forest, is the only plant in Germany turning out synthetic jewels for watches and measuring instruments.

Chemical Plant Seized.—Senior Austrian officials stated last week that the Oberdorf-Vditsberg chemical and glass undertaking in Vienna has been seized by the Soviet authorities.

Egypt to Ban Chemical Imports.—It is reported that the Egyptian Ministry of Finance has under consideration the question of banning certain industrial chemical imports with a view to protecting domestic producers.

Italy Restricting Soap Manufacture.—The Italian Ministry for Industry has caused uneasiness among industrialists in northern Italy by an order which forbids the establishment of new or extended soap factories. This order is aimed at preventing the utilisation of fatty raw materials for soap making.

South African Cement Output to be Doubled.—Plans are afoot in the Union to reach a yearly cement output of about 2,600,000 tons, *i.e.*, twice the current output, by the end of 1949. In that connection a plant is being built at Colleen Bawn, Southern Rhodesia, with an annual capacity of 100,000 tons, to start work next autumn.

"No More Nationalisation."—The United States Republican Presidential candidate, Mr. Harold Stassen, declared at a Press Conference that any future American aid to Britain should be on the condition that the British Government were not going ahead any further with socialisation plans for steel or any other industries.

Spanish Chemical Needs.—There is in Spain at present an insatiable import demand for nearly all classes of machinery, equipment, commercial vehicles, some chemicals, highly specialised products and new techniques, reports H.M. Counsellor (Commercial) in Madrid in an article in the *Board of Trade Journal*. The chemical industry has, however, expanded notably and continued very active despite short supplies of some raw materials.

Dye Manufacture in Poland.—The Polish chemical works "Boruta" recently commenced the manufacture of dyes, of which 2½ tons were produced in the third quarter of this year. A new dye named "Futromin" is in production; it is largely manufactured from the same materials as "Ursole," which was produced by the German dye trust I. G. Farben before the war

U.S. Electron Microscopy Developments.—At the fourth International Microbiology Congress, held recently in Copenhagen, Professor W. G. Wyckoff, revealed that developments in the field of electron microscopy had made it possible to "photograph organic particles of the dimensions of antibody globulin molecules."

Tin Mine Closing.—The Mount Bischoff mine, near Launceston, Tasmania, once the richest tin mine in the world, is closing down. It has recently been worked by the Australian Commonwealth and Tasmanian Government owing to the urgent need for tin, but the ore has now reached such a low grade that it is uneconomical to work the mine further.

Swiss Patent for Soldering.—A solder for aluminium and its alloys has been patented by a Swiss firm. The solder is formed into rods consisting of zinc, aluminium, copper and lead, together with mechanically hard mixing crystals. The melting point is at 300° C.—considerably lower than that of aluminium.

Explosion at Cadiz.—An explosion occurred in a workhouse containing chemical products at the Larrinaga and Echevarrieta shipyards, Cadiz, on Tuesday last. The resulting fire quickly spread to stocks of torpedoes and munitions at a submarine depôt nearby. Cadiz hospitals were said to be so full that casualties are being sent to other towns.

Offer to Nazi Victims.—According to a Foreign Office announcement, German émigrés who were removed from office by the Nazis will be enabled to regain their nationality, where deprived of it by Nazi action, and will be given opportunities of returning to their positions in the British occupied zone.

Australian Cellulose Acetate. — The Australian Colonial Sugar Refining Company has decided to establish a £1,000,000 (Australian) chemical factory in Sydney to manufacture enough cellulose acetate to meet all Australian requirements. The company is also erecting a factory at Concord, near Sydney, to manufacture asphalt floor tiles, a flooring material not previously made in Australia but extensively used in other countries.

French Industrial Goods for Polish Coal.—Two new French agreements with Poland provide for deliveries of five million tons of coal to France during the next four years. According to the first agreement, France is to receive one million tons of coal between now and the end of the year in exchange for chemicals, woollen materials and machinery. In the course of the four-year agreement, France will supply increasing quantities of motor cars and industrial equipment in exchange for the other four million tons of Polish coal.

Norsk-Hydro's Capacity to be Increased.—The capacity of the Norsk Hydro, the well-known nitrogen group in which French capital participates, is to be increased by 150,000 tons per annum when the new hydroelectric power station at Glomfjord is completed. The new electric energy will be used for the manufacture of liquid ammonia, which will be shipped to the group's plant at Horoeya for the manufacture of various nitrogeneous substances, chiefly calcium nitrate. It is reported that the new power station will be ready by the winter of 1949-50.

Company News

Bede Metal and Chemical Company is to pay an interim dividend of 6½ per cent on account of 1947. In 1946 a single dividend of 9⅜ per cent was paid.

Alpha Cement Ltd. has decided to redeem all the £237,151 outstanding 5 per cent debenture stock on December 31 at 105 per cent plus one half-year's interest.

Palestine Potash Ltd., announces a dividend of 5 per cent, less tax on the ordinary and "A" ordinary shares for 1946. This is the first dividend paid by the company since its registration in 1929. An interim of 2½ per cent on account of 1947 has also been announced. Gross profits in 1946 amounted to £57,855.

Imperial Chemical Industries Limited have declared an interim dividend of 3 per cent (actual) in respect of the year ending December 31, 1947, on the company's ordinary stock; it will be payable on December 1, 1947, less United Kingdom income tax at the standard rate, to members on the register on October 9, 1947. Dividend transfers should be lodged at the company's transfer office, 34 Portland Place, W.1, by not later than October 2, 1947.

Chemical and Allied Stocks and Shares

AWAITING the decision as to an autumn Budget stock markets have been extremely quiet in view of the uncertainty as to a new scheme of profit or dividend limitation. Buyers favoured British Funds which rallied under the lead of 2½ per cent Consols and 2½ per cent Savings Bonds, partly on the assumption that official support may be forthcoming for this market, while it is also assumed that the large sums released in due course from the "share-out" money in respect of Argentine railway debentures, will be mainly reinvested in British Funds.

Chemical and allied shares have been firm and where changed showed a number of moderate gains. Imperial Chemical were good at 48s. 7½d., the unchanged interim dividend being in accordance with general expectations. The prevailing view is that, granted there is no serious fuel crisis in the winter there will be good prospects of the total again being 10 per cent for the year. Monsanto Chemicals 5s. shares were 56s., but B. Laporte have eased to 77s. 6d., W. J. Bush were 90s. Fisons changed hands up to 66s. 3d., and in other directions, Major & Co.'s 2s. shares were 3s. 6d., with Greeff-Chemicals Holdings firm at 15s. 6d. The units of the Distillers Co. were active and higher at 140s. on wider recognition of the company's export trade scope, United Molasses became less active around 48s., British Plaster Board were 24s. 9d. Borax Consolidated were steady at 53s. 9d., and British Match strengthened to 42s. 9d., but British Aluminium at 44s. 6d., lost part of their recent rise.

General Refractories strengthened at 21s. Moreover, the possibility of early re-opening of the London Metal Exchange improved Amalgamated Metal shares to 16s. 7½d., and Imperial Smelting were better at 19s. 1½d. Paint shares received more attention on current trading reports and dividend estimates. Lewis Berger rallying to £7 while International Paint rose to £6¾, and Pinchin Johnson were firm at 56s. 6d.

Iron and steels remained firm with further moderate gains on balance, the view having gained ground that nationalisation of the industry may be regarded as indefinitely postponed. United Steel, helped by expectations that the forthcoming dividend will be maintained, were better with business up to 26s. Dorman Long were 25s., Guest Keen 47s. 3d., and Colvilles also improved to 25s. 9d. Elsewhere, Babcock & Wilcox rose further to 71s. 6d. Allied Ironfounders were 52s. 6d. Tube Investments touched £6¼, with Stewarts & Lloyds up to 52s. 6d. Indian Iron, however, fell to 46s. 3d. on fears that the Indian troubles are affecting the company's earnings. In most cases textiles shares failed to hold best levels, but were slightly higher on balance with Bradford Dyers 22s. 3d. Calico Printers 21s. 4½d., Courtaulds 49s., and British Celanese 27s.

Elsewhere, De La Rue have been 50s. British Glues & Chemicals 4s. ordinary changed hands around 18s. 9d. Turner & Newall were 71s., Levers steady at 50s., with Low Temperature Carbonisation 2s. shares slightly higher at 4s. 4½d. Sangers firmed up to 29s. Timothy Whites were 41s. 9d. Boots Drug 57s. 3d., and Wall Paper Manufacturers deferred 43s. Dunlop Rubber were again prominent and higher at 72s. in response to the scope for expansion in earnings and dividends if export targets can be attained and there is no Government scheme of dividend limitation.

Oils were again mainly affected by international political developments, Anglo-Iranian and Shell both moving irregularly, while Burmah Oil were lower on balance. Trinidad Leaseholds and other Trinidad oil shares responded to talk of higher American oil prices. Mexican Eagle oil shares were little changed, the full text of the compensation agreement containing no surprises.

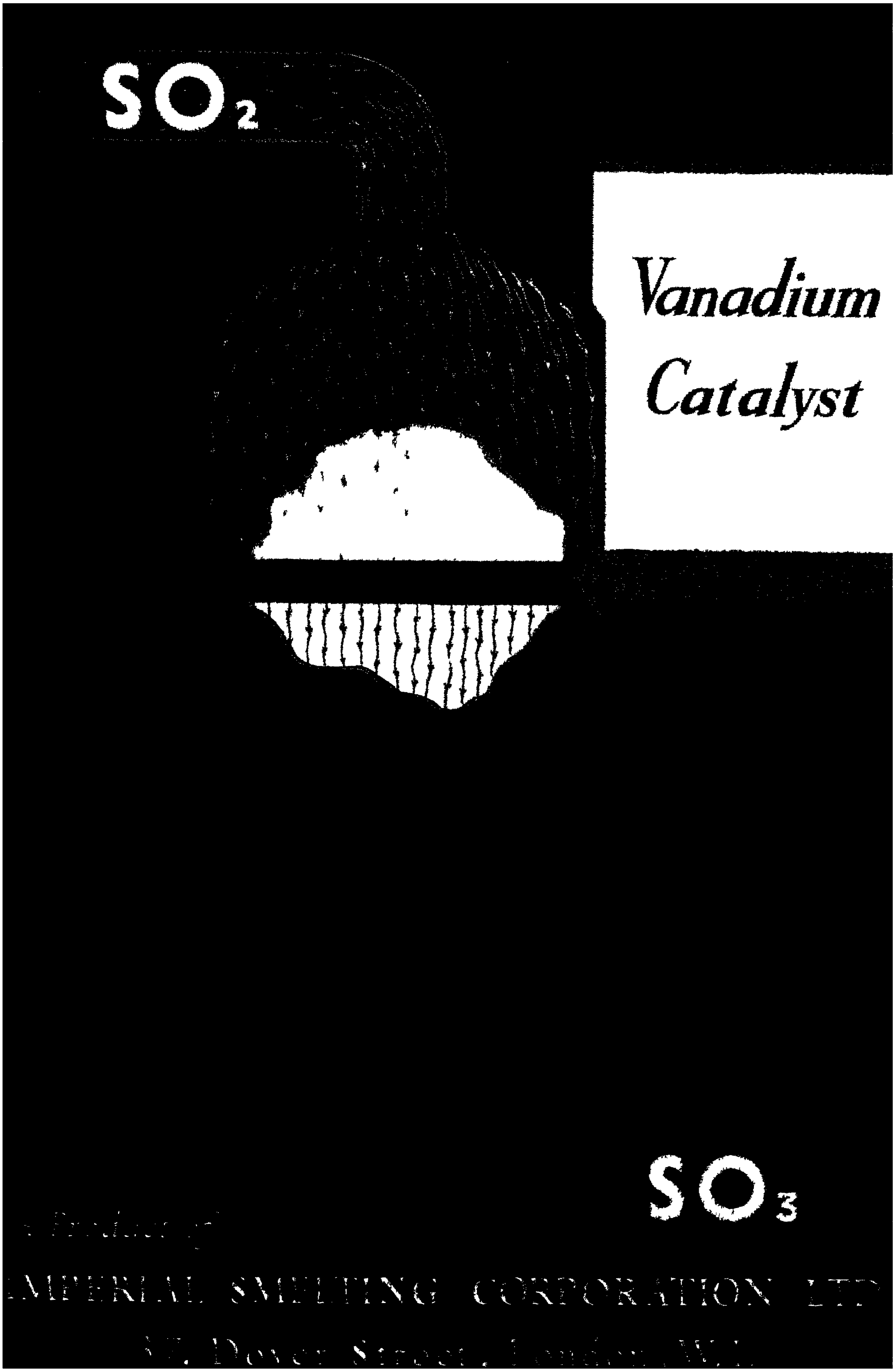
British Chemical Prices

Market Reports

ACTIVITY in the industrial chemical market during the past week has been fairly sustained and inquiry for new business for home needs and for shipment has been reasonably widespread. The price position is generally strong, and although quotations in this section remain at or about recent levels and upward movement would not be unexpected, there is an unsatisfied demand for most of the potash products, particularly chlorate of potash and caustic potash. Permanganate is moving well and is firm. In the soda products section, a good call is reported for dibasic and tribasic phosphate of soda, hyposulphite of soda, sodium sulphide, while supplies of caustic soda and soda ash and Glauber salts are below current requirements. Lead oxides are in steady demand and there is a ready outlet for zinc oxide and tin oxide. The scheduled rates for white lead and red lead are unchanged at the time of this report. Among acids, oxalic, acetic, and hydrochloric, are in active request and elsewhere hydrogen peroxide, formaldehyde, arsenic and barium chloride are in good demand. In coal-tar products an upward revision of control prices is under consideration. Demand [illegible] fully maintained with pitch actively sought at the higher price level.

The Board of Trade announces this week an increase in the price of Chilean nitrate of soda, industrial refined quality, as from October 1, to cover the increase in rail freight charges. The new price is £18 15s. per ton for 6-ton lots delivered carriage paid to the buyer's nearest station.

Manchester.—From the point of view both of the number of new inquiries and the actual volume of additional business trading, conditions on the Manchester chemical market during the past week have been brisk enough. Replacement buying in the case of bleaching, dyeing and finishing chemicals has been on steady lines and other lead industrial consumers have also been in the market, which keeps very firm in most sections. In the fertiliser market a fair amount of business considering the time of the year has been reported. In the by-products section a steady outlet is being found for most of the leading lines—light as well as heavy.



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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Process for effecting catalysed reactions —Universal Oil Products Co Jan 30. 1939 19579/1947.

Treatment of acid tars, particularly those obtained from pyroligneous acid.—Usines de Melle Dec. 17, 1943. 18011/1947.

Liquid oxygen converters—W. A Wildhack Feb. 13, 1946. 3681/1947.

Oxygen pumping systems.—W. A. Wildhack Feb. 15. 1946. 3746/1947

Production of stainless steel—Alloy Research Corporation. Feb 18, 1946. 2005/1947.

High tin solder compositions.—Aluminum Co. of America. Dec. 29, 1939. 20259/1947.

Solder flux compositions.—Aluminum Co. of America. Nov. 30, 1939. 20260/1947.

Solder flux compositions.—Aluminium Co. of America. Nov. 30, 1939. 20614/1947.

Solder fluxes.—Aluminum Co of America. Sept. 8, 1944. 20615 1947.

Formation of oxide coatings on aluminium.—Aluminum Co. of America. Feb. 15. 1945 21635/1946.

Etching of aluminium surfaces.—Aluminum Co. of America. March 13, 1944. 21636/1946.

Oxide-coated aluminium articles.—Aluminum Co. of America. Feb 20, 1943. 21637/1946.

Production of protein-containing coatings on aluminium surfaces.—Aluminum Co. of America. Feb. 15, 1945. 21638/1946.

Production of pyrazine.—American Cyanamid Co. May 20, 1942. 21189/1947.

Sintering machines and pallets—American Ore Reclamation Co. July 5, 1940. 20694/1947.

Process for the production of sodium carbonate.—Bata, Narodni Podnik May 19. 1941. 21250/1947.

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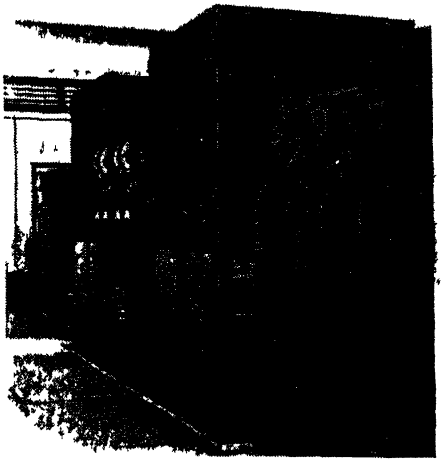

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The Chemist's Sphere

THE lecture delivered by Dr. Colgate to the Society of Chemical Industry raises a number of interesting speculations on the part played by the chemist in relation to the population as a whole. The chemist, however much he may vary from others as an individual, has in the mass certain characteristics. He is humble in the knowledge that he does not really know very much. Like Newton, he realises that the great ocean of truth lies all undiscovered before him. He has, however, to guide him a basis of ascertained fact and with that basis he can in turn guide the lives and actions of those around him insofar as applications of chemistry are concerned. His basic training, however, goes deeper than that. It teaches him to dissect his problems, removing what is known and proved from what is speculation, reducing the whole problem to its essentials, discovering its highest common factor, and thereby answering it in a way that avoids preconceived ideas, mass hysteria and other mental ills to which the world is very subject. The chemist should therefore serve partly as a stabilising force in the community and partly as a rock of common sense upon cold facts on which the waves of popular emotion break and are dissipated.

The world has changed in a remarkable manner within the lifetime of middle-aged men now living. Has there ever been a time when so many vast international issues have been raised, when there have been such striking social changes, and when values that seemed permanent to one generation have altered so quickly as to cause grave dislocation? Man's adaptability has been very severely tested during the last 40 years, principally, it must be confessed, in worsening economic conditions arising from the continuously decreased value of money. At the same time, there have arisen shortages of all that are generally considered essential for comfort, and sometimes for health; these shortages have been in part and at certain times artificial, due to over-production and consequently to prices lower than production costs, and at other times, as now, to under-production. The chemist has been blamed for many of these changes for having made his rate of discovery of new facts and processes too great. He has been praised for showing the way to new fields of economic endeavour. He is a key man in our economic system, and there has never been a time when so many have paid so much lip-service to research—generally without understanding in the least of what is involved. The chemist sees clearly that whatever be the economic difficulties of the world, the way to solve them is not to slow down research, but rather to speed it up. It is not by organising industry down to a dead level through nationalised combines that salvation lies, but rather through the play of competition. "In order to build a world of peace," said Bob Russell, President of the Standard Oil Development Company, "we must not only guard against deterioration of the high standards of technical achievement set during the war, but we must advance the effectiveness of our research, development and engineering even beyond the present high level. Given a free and truly competitive system in which to work, our scientific groups will

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deal successfully with the many problems the future will unquestionably bring."

The works chemist, in Dr. Colgate's experience—a very general experience—must be something of a chameleon, able to change his scientific colour at a moment's notice, to reflect chemistry, physics or chemical engineering and most of their off-shoots and to apply them to an increasing variety of problems. He must try to be Jack of all Trades, and master of some. To fulfil his destiny in the social life of the country, the chemist must be increasingly a man of affairs, and of wide interests. The ancient jibe that he is withdrawn from the world into a maze of test-tubes must be very far from the future truth. Dr. Colgate leaves us in no doubt that that is his opinion. "The scientist must be prepared from time to time to leave his laboratory; he cannot make the laboratory an ivory tower and leave all decisions about science, its place and rôle in the community to be made by his fellow citizens. By accepting his responsibilities and helping to form public opinion, opinion will be better informed and the likelihood of wise decision increased."

Before we can reach anything resembling the perfect world in which reason will take the place of animal desires, it is necessary that there should be a general spread of the knowledge of science. If reason were predominant to-day, we should not be seeking for means to induce certain sections of the community to work harder and so to pull their weight. Dr. Colgate's view is pessimistic: The man in the street is to-day almost as ignorant of the spirit of science, its past achievements and future potentialities, as was the original holder of the Piltdown skull. A drastic judgment, but to some extent justified. The chemist, along with his fellow scientists is the only man who can do much about it. Dr. Colgate holds that the chemist should develop public education in science. He suggests that a popular science club should be formed at a number of centres in the British Isles to which members of the public would come to hear discourses by local scientists in simple and interesting language, finishing with a free-and-easy discussion open to all. Dr. Colgate is an enthusiast and expects that the public would come to these meetings. Something after the lines of rotary clubs might work, but would the public come month by month to hear popular scientific discourses? Perhaps so: the idea is worth trying.

One of the difficulties in popularising science is that those who live by science are not well equipped to discuss their subject in popular language with the possessors of modern Piltdown skulls. Too many practitioners of science can write and talk only in terms of their own stilted technicalities. That is where a wider education comes into play. Should not the scientist in his school days be taught the minimum of science and the maximum of the humanities? The popular American high-class Press, we mention no names, frequently carries scientific or medical articles in which the achievements of science are described in somewhat flowery and over-enthusiastic language, usually linked to personalities, no doubt for the sake of popular appeal. To read these articles is for the scientist to feel that the whole thing is not in the best of taste, that the individuals mentioned must feel supremely uncomfortable, and that in any event the description has been over-simplified. That feeling is due to our scientific up-bringing and to our habits of mind. The justification for the American method is that it is the way to get the achievements of science over to those who must be taught the easy way. This whole question of the education of the man-in-the-street in science is supremely important. Until it has been tackled successfully the chemist and his colleagues, will not be able to pull his weight in the social and economic life of the country.

NOTES AND COMMENTS

Labour Paradox

THE manufacture of heavy chemicals and chemical engineering plant is essential but " not very important." That, fantastic as it may seem, is the inescapable implication of the last and presumably final pronouncement of the Ministry of Labour's intentions in applying the new Control of Engagement Order, which came into force on Monday. Since then, it appears, any chemical manufacturer or chemical engineer who has engaged a workman by any means other than the local office of the Ministry of Labour has placed himself outside the law. Finding it difficult to credit that the omisson of chemical manufacturing and chemical engineering from either of the two lists of industries to which available labour is now to be directed could have been deliberate, this journal sought confirmation this week from the principal organisation representing chemical manufacturing employers and from the Ministry. The answers were, in different ways, alarming. The representatives of the organised manufacturers intimated that the implication of the new order was news to them and said—very understandably in the circumstances—they had no statement to make. The Ministry, after a suitable pause for cogitation, agreed to answer a specific query, provided it was made in writing, but not, fortunately, " through the usual channels." This query, or rather two of them, were at once posed to the Ministry, with results which are reproduced on another page.

Not " Very Important "

THE chemical and chemical engineering industries, states the Ministry, *are* " essential industries," but, because they are not " very important industries and services, undertakings in which are generally undermanned " they will not figure in the front rank for the purpose of future allocations of labour. If the chemical industries were " very important work where the shortage of labour is not general or where the work concerned is normally only a part of individual industrial undertakings " they would still rank second in the queue for labour. But they are not, and vacancies in these chemical industries —for which it is pertinent to note Sir Stafford Cripps recently set minimum monthly export targets of £5.45 million and £.12 million—must be filled " insofar as labour is available," meaning those whom the favoured industries do not want, or who decline to be directed to them. The contrast between the element of free will conceded to the worker and the control exercised over his employer is conspicuous.

Export Aids

THE exhibition of the latest achievements of electrodeposition, which was an important adjunct of the recent congress in London of international experts organised by the Electrodepositors' Technical Society, helped one to take a more optimistic view of our prospects of reaching the new inflated export totals now being called for. A non-commercial exhibition, devoted entirely to technology, it had the essential ingredients of a most profitable trade fair. Provided essential supplies are not curtailed, nothing is likely to lubricate overseas trading more effectively than some of the newer metal treatments shown in their highly attractive perfected form at this exhibition. Specially worth attention in this connection is the anodic polishing method represented by a number of small metal wares produced by the Walsall firm of W. Bate, Ltd. Its outstanding merit is that it eliminates at all stages the costly and generally disagreeable processes of hand or mechanical polishing. The anodic process now completely replaces this stage, leaving the work with a perfectly polished surface on which the final plating is deposited with admirable results. This outstanding contribution was, of course, only one of the very significant advances shown in the technique of electrodeposition, almost equally fruitful being the progress recently made in the application of metal finishes to plastic bases, which promises to have very profitable uses in the production of decorative objects, and a new simplified method for the production of dies using easily worked plastic moulds. The value in present circumstances of innovations such as these cannot be exaggerated and the exchange of such kinds of information which the congress and the exhibition have permitted is the best pledge of the increasing usefulness of the Electrodepositors' Society.

Powell Duffryn and Borneo

ANY suggestion that the coalmines have been nationalised because of inefficiency on the part of the former owners—a line taken by some Government spokesmen—would seem to be inconsistent with the task recently allotted to Powell Duffryn, Ltd., by the Colonial Office. It may be fairly said of Powell Duffryn, Ltd., that it was the largest coal-producing concern of pre-nationalisation days—that is to say when coal was unrationed, reasonably priced, unassociated with labour troubles, and a considerable contributor to our national income. Through its subsidiary company, Powell Duffryn Technical Services, it has just sent a team of mining experts to Borneo where it will presumably search for coal deposits, and draw up development and production plans. It will be interesting to watch the outcome of these arrangements to see whether private enterprise with all its alleged shortcomings can succeed where a Government department did not care to set its foot.

NO PRIORITY FOR ATOMIC RESEARCH

WHY THE HARWELL PROJECT LOST SIX MONTHS

BRITAIN'S main hope of harnessing atomic energy to industry, the atomic research station at Harwell, Berkshire, is about six months behind schedule. That was stated by Dr. J. D. Cockroft, director of the Research Establishment on Atomic Energy, at an independent inquiry called for by the Select Committee on Estimates, the proceedings at which are now published as an official report (132-1, H.M.S.O., 6s.).

"Crux of the Job"

It was authoritatively stated that the reasons for this delay were the difficulty in obtaining supplies of all kinds and the fact that the research station enjoyed no special priority.

Mr. G. H. Bosworth, Assistant Secretary, Ministry of Works, which is responsible for the construction of Harwell, said that the cost so far was £1,343,375. "The great hold-up now," he said, "is not in the building, but on engineering supplies. The crux of this job is what priority we get on engineering supplies. We have no real priority. It has never been fixed—that is rather an astounding thing to say—as a top priority job.

"For instance, we cannot rob housing of labour if we want it. We cannot rob electrical undertakings of labour which is now being used to boost up the power stations.

"One of the relatively bad hold-ups is on the chemical laboratories. There are ducts and extractor fans, and all that sort of thing wanted."

Another serious contributor to the delay was uncertainty about the possible release into the Thames of radio-active elements. Sir Ralph Glyn, chairman of the subcommittee conducting the inquiry, said that the Thames Conservancy was holding up the project because it was not satisfied that the effluent would not have dangerous effect on London's water supply. Sir Edward Appleton, secretary of the Department of Scientific and Industrial Research, said that the Water Pollution Research Laboratory was tackling this problem in association with the Medical Research Council.

Sir Archibald Rowlands, Permanent Secretary, Ministry of Supply, said the work was being done in such a highly unknown field it was impossible yet to say when they would produce the first fissile material for a generating station. America was probably far in advance of us, but it was by no means certain that we could expect to benefit from the findings of American experiments.

Better U.S. Linseed Crop

Reports from America state that this year's linseed crop is about 40 per cent above that for last year, and the general level of linseed oil stocks are said to be about 30 per cent higher on balance. It is therefore confidently expected that supplies will more than meet domestic demands, thus leaving a surplus for export.

Previous allocations of oil from the U.S. to Britain have been small compared with those from Argentina, though the latter country's prices have been higher than those which are expected to prevail in the U.S. this year.

CONTROL OF ENGAGEMENT ORDER

APPLICATION OF PRIORITY SYSTEM

IN order to facilitate a general understanding of the Control of Engagement Order, the Ministry of Labour has issued an explanatory outline of the arrangements whereby those workers covered by the Order may in future be engaged. It is laid down that the following two principles shall apply: (1) Applicants' skill should be used to best advantage, and (2) applicants should be accommodated quickly.

As workers become available, they will first be offered vacancies in what are described as "First Preference" industries, which include mining (coal, iron, oil-shale, clay, etc.), iron and steel producers, textiles, and agriculture. These industries are for the most part undermanned, and are important—directly or indirectly—to the export drive.

Second Choice

Next in order of priority are those industries similarly important to export trade, but where there is at present no general shortage of labour. Engineering firms engaged in the production of machinery for the "First Preference" industries or for direct export are generally included under this heading. Third and last on the priority list will be those vacancies occurring in industries which the Ministry may regard as having a bearing on the prosperity and well being of the nation without necessarily affecting exports.

It is pointed out that, as experience is gained in the reallocation of labour, it may be necessary to amplify the general guidance principles as outlined above.

Questions to the Ministry

In order to clarify the position, THE CHEMICAL AGE this week asked the Ministry of Labour to answer the following questions relating to the two classes of industry to which workers will be directed.

(a) Does the exclusion of the chemical industry and the chemical engineering industry from List A (Very Important Industries and Services . . .) and List B (Very Important Work where the shortage of labour is not general . . .) indicate that there will be no priority given to these industries in the allocation of labour?

(b) How will labour be obtained to replace the constant wastage of manpower which these industries in common with others experience?

Offical Ruling

These are Ministry's replies:

(a) Inclusion in lists A and B means that vacancies in the industries or undertakings concerned will take precedence over others. These vacancies, if suitable, will be offered first to applicants under the scope of the Control of Engagement Order. If there are no suitable vacancies of this kind or an applicant is not prepared to consider any such vacancies he will be offered suitable vacancies on other essential work including vacancies in the chemical industry or the chemical engineering industry.

(b) Work in the chemical industry or the chemical engineering industry is regarded as essential and vacancies in these industries will be filled, insofar as labour is available, by workers not required in the industries, etc., in list A or B, or unwilling to take work in such industries.

POWER SAVING PLAN STARTS

INDUSTRIES all over the country on Monday had their first experience of the operation of the fuel economy system, involving an extension of the staggering of working hours and the application of the new rationing plan evolved by the Central Electricity Board.

The effect of the latter is to allot to distributors of electricity a fixed maximum to enable them to plan distribution and avoid unexpected interruptions in the supply. To keep within this maximum some local electricity authorities have divided their regions into five areas, withholding power from each on one or other of the five working days.

It is too early to evaluate the success of the new system, but reports from the important north-west industrial area seem to indicate that full co-operation has not yet been secured. Towards the required reduction there of 33 per cent, Liverpool was reported at the beginning of this week to have ready plans which would save 17 per cent, and Manchester and Salford about 25.

STEEL FIRM'S EXPERIMENT

FUEL load staggering was introduced at the Clyde Alloy Steel Works, Netherton, Motherwell, on September 29, a full week before the official load-saving scheme was due to commence. From that day onwards, the firm's No. 3 mill has operated a two-shift system over each 24-hour period. Only afternoon and night shifts are worked, thus cutting out the day-shift—which operated during the peak period—and enabling the firm to cut down by about 1000 kW.

Accidents with Acetylene

Explosives Inspectors' Report Gives Useful Data

IMPORTANT data relating to accidents associated with compressed acetylene and, to a smaller extent, with calcium carbide receive special attention in the 71st annual report of H.M. Inspectors of Explosives for 1946 (H.M.S.O., 1s.).

As indicated last week, an Order in Council under the Explosives Act has been drawn up to regulate the extended use in industry of acetylene under pressure. This is based on the results of investigations of a number of accidents, which the report summarises as follows:

(a) The greatest care should be taken in charging cylinders with porous mass in order to avoid any possibility of the presence of cavities; in addition, during the annual examination every effort should be made to ascertain whether any sagging of the mass has occurred and thus given rise to cavities.

(b) When testing the pressure of cylinders by means of a pressure gauge the valve of the cylinder should be opened slowly, otherwise ignitions may occur due to possible ignition by adiabetic compression.

(c) The utmost care should be taken to exclude copper from fittings such as pressure gauges in order to avoid the possible formation of copper acetylide. We would strongly urge the exclusion of copper alloys.

(d) Cylinders should be handled carefully and not submitted to shocks.

(e) When cylinders are involved in a fire the owners of the cylinders should be informed. It is possible, in these cases, some decomposition of the acetylene may have occurred with the production of carbon which may lead to a catalytic decomposition of acetylene in a cavity in the porous mass.

Checking Decomposition

An investigation into the properties of various porous masses has been started and so far the results show that where internal decomposition has started in the cylinder of dissolved acetylene, this decomposition is best checked by cooling externally with water and closing the valve of the cylinder. If the cylinder valve is opened the decomposition is aggravated and becomes progressive—hence the cylinder may burst.

The most serious of a number of accidents with gas cylinders described in the report relates to the bursting of a propane cylinder at a railway workshop. The exploding cylinder became a projectile which struck a group of workmen some 20 yards away.

Five men were killed and eighteen were injured more or less seriously. The explosion is thought to have been caused by the inadvertent coupling of the hoses of the propane cylinder and an oxygen cylinder being used in a flame cutting operation. The oxygen could thus have entered the propane cylinder and formed an explosive mixture which was probably ignited when the blowpipe was lit.

Less readily explicable was the explosion, fortunately without serious results, of an ethylene oxide cylinder eight hours after some of its contents had been removed. It is possible that polymerisation had taken place, leading to rapid decomposition of the ethylene oxide into gaseous products.

An important point which arises in more than one of the other accidents studied is that the use of copper or copper alloys in acetylene cylinders is inadvisable. In the presence of copper, which commonly represents a large proportion of the composition of Bourdon tubes, copper acetylide may be found and initiate an ignition.

Heat and shock are factors of other accidents which had led to the decomposition of acetylene in cylinders with destructive results.

EMPLOYMENT OF CHEMISTS

THE position of chemists in industry in relation to the Control of Engagement Order, which, as mentioned in THE CHEMICAL AGE last week, was at that time uncertain, has now been made clear. Information has now been received that scientists—among whom is specifically included the industrial chemist—are not covered by the order.

Fire Protection Association

Fire destruction in Britain last year cost over £12 million. This is the first consideration which has animated the formation of a national Fire Protection Association in collaboration with the Fire Offices' Committee of the insurance companies, the formation of which is announced this week in a booklet issued by the association from the Fire Offices' Testing Station, Boreham Wood, Elstree, Herts. Anyone becoming an associate member for an annual subscription of £1 will receive information on all developments in fire protection.

Hungarian Nationalisation.—Hungary intends to nationalise the bauxite and aluminium industries. As a result of the Hungarian-Jugoslavian aluminium agreement, the Hungarian Supreme Economic Council has established the " South-East European Industry Promoting Company " as a trading agency.

Progress in Industrial Measurement

Some New Scientific Aids Described

by L. SANDERSON

THE development of manufacturing processes in every field has led to an ever-increasing demand for more accurate and scientific methods of measurement. In the following notes an outline is given of some of the latest devices of which use is being made in industry to-day.

The New Potentiometer

The self-balancing recording potentiometer is becoming more and more widely used in chemical processing. In principle, the potentiometer determines the magnitude of the e.m.f. developed by a thermocouple, and its principle is indicated in Fig. 1. Such an instrument is basically designed to measure difference of electrical potential or pressure.

The wire of the potentiometer is initially standardised in terms of e.m.f. (AX) per unit length, and for this purpose the positive terminal of a standard Clark or Weston cell is connected to A and its negative terminal to B. The battery -current is in this way opposed to that of the cell. By changing the position of X, it is possible to reach a point at which the galvanometer pointer is not deflected. The fall in potential between A and B is then equal to the e.m.f. of the standard cell, which is proportional to the length of AB.

Each unit of length of AB consequently stands for a definite e.m.f. if the resistance and e.m.f. in the battery circuit are maintained constant. If, then, the standard cell is replaced by a thermocouple, but the position of X is maintained, the contact B can be changed until, once more, no deflection of the galvanometer is discernible. When this new point of contact (B_1) is obtained, the e.m.f. developed by the thermocouple is AB_1/AB times that of the standard cell. In more practical forms, such as the Tinsley potentiometer, the wire AB is replaced by a series of small coils that can be successively inserted or removed from the thermocouple circuit.

The latest developments that have rendered the potentiometer suitable for chemical processing comprise fundamental modifications of improved kind in the mechanisms designed for detection and re-balancing. For example, instead of the standard galvanometer to detect changes in the measured variable, electrical means are being employed. Moreover, the cyclic rebalancing mechanism has been dispensed with, and in its place an electronically controlled motor has been introduced. This rebalances the indicating or recording system continuously so as to relate it to modifications in the measured variable.

The Converter

In one of the new potentiometers of this electronic type, the D.C. millivoltage set up by the thermocouple is altered to an A.C. of proportional voltage magnitude in a converter, consisting of a flat metallic reed oscillating between a pair of contacts linked up with the opposing extremities of the primary winding on an input transformer. The unbalanced D.C. voltage is impressed across the converter and the centre tap of the primary winding on this transformer.

When the reed passes from one contact to the other, any unbalanced D.C. voltages make D.C. flow initially in a single direc-

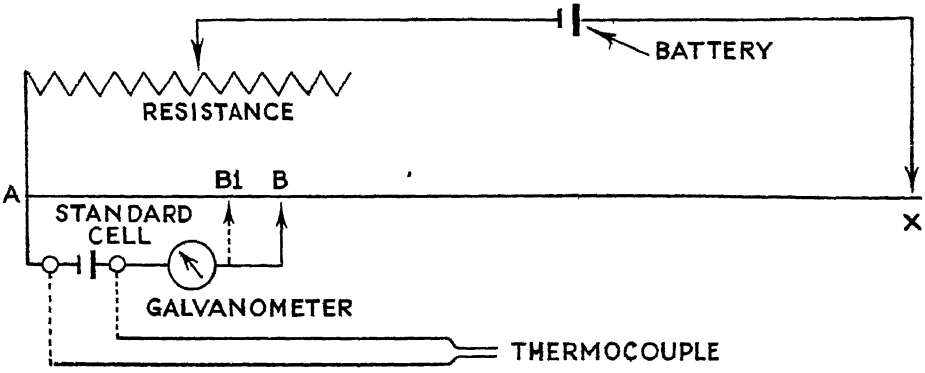


Fig. 1.

tion through one half the primary winding, and afterwards in the reverse direction through the remaining half. In this way an alternating flux is developed in the input transformer core, and this then induces an alternating voltage on the transformer secondary.

The converter action is related to A.C. voltage by an energising coil excited by A.C. voltage through a stepdown transformer. By means of a permanent magnet, polarisation of the reed is achieved, which reed is, in consequence, actuated by the energising coil to oscillate synchronically with the A.C. voltage. One contact to the transformer is closed by the reed for one half the supply voltage cycle, so that each cycle involves an entire oscillation.

The D.C. flowing in each half of the transformer primary winding consequently causes an alternating voltage in the transformer secondary, having identical frequency with the supply voltage. This alternating voltage is amplified in voltage and power to the point at which it will operate a two-phase balancing motor.

Unbalance between slide wire voltage and thermocouple voltage causes the balancing motor functions to rebalance the two voltages by moving the slider on the slide wire. The turning direction of the motor is governed by a specific phase relation between the A.C. voltage and the amplified A.C. thermocouple voltage, a relation that is naturally based on the increase or decrease in magnitude of the measured variable.

The result of these improvements is claimed to be a swifter operation, maximum sensitivity and precision of measurement, and higher reproducibility.

The Extensometer

This instrument is designed to measuure with precision extremely minute variations in length, mostly in parts or materials subjected to compression or tension. The extension has to be measured progressively in order that a load extension curve may be based on the data provided.

In the latest instruments this curve is automatically drawn by a subsidiary part of the appliance called the autographic recorder. The variations recorded by this instrument must be 0.0001 in. or even less than this, and the extensometer must also be adequate in strength to the work it is called upon to do.

A further point is that the weight of the appliance must not be too great, while the way in which it is secured to the specimen being tested must involve no distortion or mutilation of the material's surface. There must also be a minimum of moving parts in order to avoid backlash.

The most modern type comprises two closely similar portions secured by a joint clamp to opposing sides of the specimen. Each section comprises a pair of flat bars each having a 90 deg. angle of bend at one extremity, which is given a knife edge. Each bar comes into contact with the specimen on this knife edge, while the bars are so formed and fixed that some room is left between the flat parts. A small hardened steel roller is introduced into this space. The bars are able to move in relation to one another, but this motion, when the instrument is fixed in place, is obtained only by relative motion of the knife edges.

In consequence, when the specimen lengthens, the plates move in relation to one another, and the roller revolves through a small angle. By means of a small mirror fixed to the roller and a light beam focused on the mirror and reflected on to a graduated scale, it becomes possible to determine the amount of extension.

If two extension elements are employed, the average of the extensions on each side of the specimen can be measured, the light beam being focused on first one and then the other mirror, and so to the scale. This type of extensometer is capable of detecting an extension of 0.00001 in. in 8 in.

The Electrical Ionisation Gauge

This type of gauge is akin to a triode valve in shape, and is closed and sealed on to a vacuum system. It contains a filament or cathode which is raised in temperature by an electrical current, and on application of a positive potential to the anode, a current is generated.

This current is obviously composed of streams of electrons, and as these travel through the gas in the valve, they come into collision with the requisite proportion of molecules, which they ionise. As a result, the positively charged ions are drawn to the grid or collector, which is negatively charged, and in this way a small current is caused to flow in the circuit. The magnitude of this current is governed by the pressure at low values, as long as other factors remain constant.

The purpose of this type of measuring instrument is to give precise measurements of pressures ranging from 10^{-2} mercury down to the minimum obtainable, assuming that the instruments at hand have sufficient sensitivity to measure the ionisation currents. The actual calibration is governed by the gas present. This instrument is principally employed in the routine evacuation of valves and X-ray tubes.

The X-Ray Spectrometer

X-ray diffraction studies of materials have been handicapped in the past by the length of time and the elaborate technique required, but an X-ray spectrometer of geiger counter type has lately been introduced to shorten the period necessary for analysis, and virtually to remove.

the necessity of special procedures in carrying out analyses.

The old photographic film method in this type of analysis has been rendered obsolescent by the geiger muller tube, which actually counts the quanta of X-ray energy reflected from the sample. The tube has practically 100 per cent accuracy for the typical X ray wave length employed, *i.e.*, one count is produced for almost every quantum passing into the tube.

The apparatus itself consists of a tube on the lines of the instrument described above, and caused to rotate through an arc of 90 degrees by a motor-driven scanning arm. The rotational speed is exactly co-ordinated with the chart speed of a high speed recording potentiometer to set up a precise space relation of the different humps and hollows of intensity from the specimen. Ninety minutes produce a complete diffraction pattern with the high speed recorded

Among instruments now being widely used, particularly in gas works, to measure density, one may mention the specific gravity bell. This comprises a bell inverted and furnished at the top with a tube in which is a platinum plate, known as the orifice plate because of a tiny hole drilled in it.

The open end of the bell is placed in water inside a vessel. The period taken by a specific volume of gas to diffuse through a minute orifice varies inversely as the square root of the density of the gas.

The bell, in operation, is elevated and filled with air. When the tap is then opened, the air diffuses through the orifice plate, and a precision measurement of the time it takes the pointer to travel between two marks on the scale plate is made. The technique is repeated for the same volume of the gas whose density it is required to know. The periods of effusion and the density of the air being known, it becomes a simple matter to work out the density of the unknown gas.

The Interferometer

The basic principle of the interferometer is that if as a consequence of a single wave train there is a displacement X in a specified direction at a particular point and time, and by reason of a second train acting by itself there is a corresponding displacement Y, then the instantaneous consequent displacement R of both waves in combination is the algebraic sum of the separate displacement, *i.e.*, $R = X + Y$.

In the latest improved instrument of this type, no mechanical contact occurs between either end of the gauges, and for this reason there is no wear whatsoever on the master gauge. In addition, it becomes feasible to measure absolutely the master gauge length.

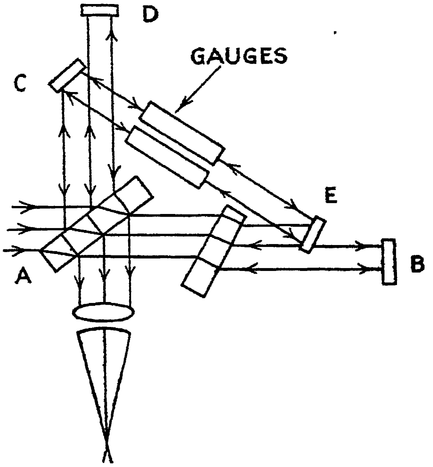


Fig. 2.

The instrument is designed in the following manner. A perceptibly parallel light pencil is divided in the normal manner at a half-silvered mirror (see Fig. 2). Taking the lower half of the half silvered mirror A first, the transmitted light travels to a mirror B in which it is reflected back along its own path, while the reflected light is thrown by another mirror C at an angle of 45 degrees on to the extremities of two gauges, whence the light is reflected back along its own path.

The mirrors and gauges are so located that all these paths are of the same length. Consequently, when recombined, they constitute fringes with white light. If the central black fringe is continuous in both surfaces, this pair of gauge surfaces must be in precisely the same plane.

Taking now the upper half of the half-silvered mirror, it will be found that the reflected light travels to a third mirror, D, and is thrown back along its own path, while the transmitted light travels to the mirror E, and is reflected to the other extremities of the gauges before it is thrown back along its own path, both beams coming together again to create a similar interference pattern.

When the gauges are not of the same length, the number of bands and parts of a band by which displacement of the fringe system occurs is measured, and the precise variation to a millionth of an inch in length ascertained.

If the two mirrors D and E concerned are inclined in the proper way, it becomes feasible to regulate the fringe spacing to whatever value is desired. Employment of the fractional band technique, together with a range of chosen wave lengths and a special reference gauge, enables the absolute length of a gauge to be established.

Chemical Statistics in July

Continued Increase in Employment

THE steady increase in employment in chemical and allied industries recorded every month since March this year was continued in July, as shown in the survey of national employment, production and use of basic materials provided by the *Digest of Statistics* prepared by the Central Statistical Office (H.M.S.O., 2s. 6d. net).

The total labour force engaged in July in production of chemicals, explosives, paints, oils, etc., was 352,000, as compared with 351,100 in the previous month and 335,800 in June last year. The same trend is reflected in a further grouping under the head of explosives, chemicals, coke ovens and by-product works, which employed a total of 238,600 in July, representing an increase of 2000 since May.

The production of scientific instruments employed 66,000 in July, a slightly smaller total than in most months since April.

Fewer Women

Increased employment of men and a small but consistent fall in the number of women engaged in the industries is a common feature of most of the employment records.

The summary of production, consumption and stocks of heavy chemicals and non-ferrous metals shows few very marked fluctuations when contrasted with returns for 1946. Of sulphuric acid 107,000 tons was produced in July, 2600 tons less than a year ago, consumption increased 2000 tons, but the stock position was, notwithstanding, slightly more favourable than it was a year before. Sulphur stocks also were substantially heavier, despite the fact that demand during the month was on a considerably larger scale; holdings of pyrites, however, were 9000 tons lighter.

There were good rises in the production figures of molasses (cane and beet) and industrial alcohol, the former totalling 11,700 tons, against 8800 a year ago, and the latter 2,680,000 bulk gallons, against 1,850,000. There was an appreciable rise in the use of industrial alcohol, but very much heavier stocks were held.

Production of most fertilisers was somewhat smaller; use of ammonia was rather lighter and stocks were heavier.

There was a good deal of fluctuation in supply and demand for non-ferrous metals, of which the most welcome feature was a fairly substantial rise in stocks of copper and lead.

SERVICE CHEMICALS FOR DISPOSAL

THE Ministry of Supply was offering this week "at a nominal figure" 410 tons of " anti-verm " residues extracted from Service clothing, consisting principally of 2 : 4-dichlorphenyl benzoyle chloramide (C_6M_5.CO.NCl.$C_6H_3Cl_2$). By suitable treatment benzoic acid and 2 : 4-dichloraniline can be recovered from the residues. It is estimated that 1 ton of anti-verm residues should yield 0.31 to 0.32 tons of benzoic acid and 0.41 to 0.42 tons of dichloraniline. The residues contain approximately 58 per cent of the pure compound with a certain amount of water and a small quantity of wool and cotton fibres from the clothing.

Any firm interested in this material, which is available at Bridgwater, Somerset, should apply to Ministry of Supply, A.D. of D (B.2), Room 222, Great Westminster House, Horseferry Road, London, S.W.1.

		July, 1947 Thousand tons			July, 1946 Thousand tons	
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	107	113	62.8	109.6	111	62.7
Sulphur	—	17.9	79	—	16.6	56.7
Pyrites	—	14.4	76	—	16.9	85
Spent oxide	—	14	151.5	—	15.6	139.6
Molasses	11.7	39.2*	106.9	8.8	26.9*	152.3
Industrial alcohol (million bulk galls.)	2.68	2.82	5.09	1.85	2.63	1.65
Superphosphate	63	59.7	105	73.3	76.1	83.7
Compound fertilisers	73	57.7	105	91.7	53.4	154.6
Agricultural lime	—	256.8	—	—	291.8	—
Ammonia	—	23.31 (23.7)†	3.52	—	24.29	3.44
Phosphate rock (agricultural) ...	—	54.7	138.9	—	54.7	145.5
Phosphate rock (industrial) ...	—	4.49	35.4	—	3.49	15.1
Virgin aluminium	2.37	13.4	—	2.74	9.2	—
Magnesium	0.15	0.42	—	0.17	0.12	—
Virgin copper	—	29.6	96.5	—	26.1	83.3
Virgin zinc	—	17.8	31.5	—	17.8	70.4
Refined lead	—	16.1	32.3	—	17.8	23
Tin	—	2.37	16.8	—	3.97	20
Zinc concentrates	—	14.0	69	—	13.7	109

*Distilling only † August

FOOD YEAST FROM TIMBER WASTE

HIGH NUTRITIVE YIELDS OBTAINED

Among the papers read at the last Convention of the American TAPPI (Tech. Assn. of Pulp and Paper Industry) held in New York, was a further contribution to the interesting subject of utilising waste sulphite liquor for production of fodder yeast from its constituent wood sugars. The paper was by Elwin E. Harris and fellow workers.

This waste liquor and also wood hydrolysates contain carbohydrates which may be suitable for conversion. Sulphur dioxide is removed by steam treatment or precipitation with lime and the resulting solutions neutralised to *p*H 4—4.5, then concentrated to 40 per cent total solids. Suitable nutrients are added and the mass inoculated with a yeast of the *Torula* type.

The waste liquor is sterile and therefore very suitable for continuous propagation of yeast. There is, however, likely to be some trouble with excessive foaming, and this may be overcome by means of a mechanical device which allows the gas bubbles to break as the liquid falls down a central draught tube. Magnesia base liquors may also be used.

Suitable Yeasts

In a paper on the same subject (*Ind Eng. Chem.*, 1946, **38**, 617-19) various yeasts of the *Torula* class were compared, including *Torula*, *Mycoetorula*, and *Hansenula* strains, as to their suitability for this sugar conversion. They gave satisfactory results with waste liquor from Douglas fir hydrolysates, and there was seen to be little distinction in rate of growth, utilisation of sugar, yeast yield, and nutritional values.

The products should be an excellent source of protein, amino acids, and B vitamins, comparing favourably in this respect with the best strains of brewers' yeast. Yields of dry yeast ranged from 53-63 per cent of weight of sugar consumed.

This matter of using to good purpose waste liquor from the pulp mills has proved of particular interest in Florida and other south-eastern States, where there is a shortage of suitable feeding-stuffs for an ever-expanding cattle and poultry industry; and at the same time where there is also a considerable amount of this pulp material available but hitherto largely wasted.

In their paper on protein feed from sulphite waste liquor, Walker and Morgan (*Paper Trade Jnl.*, 1946, **123**, 43-7) refer to these conditions in Florida and other States and point out that only about half the wood going into the pulp and paper industry is fully utilised. The sugar present in the waste liquors is still wasted.

They found that the liquors obtained from cooking the southern pine differed in composition from those obtained from other sources. The percentage of combined sulphur is much higher and only a minor amount of sulphur dioxide can be recovered by either steaming or evacuation. Their method of producing yeast utilised more than 90 per cent of the reducing sugars, with only negligible quantities of ethyl alcohol.

Practical Problems

Their experiments were, however, not conducted on a scale sufficiently large to determine accurately the economics of the process. It appeared that aeration costs would be an important factor in working on a larger scale; and it is intended to carry out these larger scale operations in order to calculate these and other items. Meantime, the optimum conditions for the laboratory tests were found to be: *p*H 5.5—6, aeration 150 c.c. air per minute per litre of sulphite waste liquor (specific for size and shape of fermenter and air diffuser), nutrients were 2.0 g. of ammonium acid phosphate $(NH_4)_2HPO_4$ per litre, temperature 30-35° C. Strain of yeast used was *Torulopsis utilis*, var. *thermophilia*. Owing to surface activity, foaming was overcome by use of 0.1—0.2 per cent turkey red oil, which proved non-toxic to yeast, whereas other anti-foamers were extremely toxic. A short bibliography of 14 references is given.

A very detailed and well illustrated account of the use of sulphite liquors in Germany for food purposes, by working up into yeast products, is given by J. F. Saeman and co-workers in a special report issued by the Forest Products Laboratory of the U.S. Department of Agriculture. This is based on information obtained by the authors as members of the Forest Products unit of the Technical Intelligence Branch that visited Germany for the purpose. (*Paper Trade Jnl.*, 1946, **123**, 38-46.)

Big Yields in Germany

The production and utilisation of wood sugar played a small but significant part in aiding Germany's food supply during the war. Several different processes were tried, Scholler, Vogelbusch, Waldhof, etc. Plants producing alcohol by the first-named had a capacity of 10 million litres per annum, and those in which the alcohol was obtained from sulphite liquor had a yearly capacity of 25 million litres.

Total capacity of plants for production of yeast from wood sugar of all sources was more than 25,000 tons per annum; and additional plant for sulphite liquor yeast was under construction at the end of the war.

Practically the whole available supply of this liquor was used to produce alcohol or yeast, the Waldhof method being almost exclusively used for that purpose, after several others, such as the small unit at the I.G. Farbenindustrie plant at Wolfen, had been tried.

The Waldhof is continuous, requires about 4½ hours, and uses mechanical aeration and foam-breaking equipment. Yields up to 40 per cent on reducing sugar content of the sulphite liquor were obtained, and spruce or beech were equally satisfactory.

This process had been in use for over four years. It appears to be well designed and efficient, and in the opinion of the investigators offers the best hope of effectively solving the sulphite liquor utilisation problem.

Full details, together with working data and blue prints, are available from the Forest Products Laboratory, U.S. Department of Agriculture, Madison 5, Wis. It is suggested that the technique employed may be useful for other industrial aërobic fermentations, such as for bakers' yeast and penicillin production.

High Food Value

The nutritive value of this sulphite liquor yeast has been thoroughly tested in other parts of the U.S.A., as recorded in several papers published in the *Northeastern Wood Utilisation Council Bull.*, 1946, No. 12, in which reference is made, *inter alia*, to work in this country, by the National Institute for Research in Dairying, Reading, in feeding tests with pigs, poultry, and cows, with 5-20 per cent yeast supplements.

In this particular paper, by R. S. Aries, it is also stated that sulphite waste liquor and wood sugars have been largely used in Germany as sources of yeast for meat substitutes, etc., forming a valuable source of protein and B vitamins. It is claimed that as a supplement to poor diets the effect of yeast exceeds that of milk or fish, whether for adults or children.

In a further paper by the same author, R. S. Aries (Polytech. Inst., Brooklyn, N.Y.) reference is made to the fact that yeasts vary little in analysis whether of the *Saccharomyces cerevisae* or *Torula utilis* type, and whether derived from molasses, wood sugars, sulphite waste liquors, or brewers' slops. Comparisons are made in nine tables with other protein materials, *e.g.*, the vitamin B group and amino acids, confirming the high value of yeast in this respect. It is also easily digestible, with an energy content of 4600 cal./kg., and approaches complete animal protein in nutritional value.

In the same series of papers (*loc. cit.*) M. M. Rosten discusses the economics of dry food yeast. The cost there is about 4 cents per lb., with a yield of 50-50 per cent of reducing sugars. A flow sheet simplifying German practice is proposed.

E. G. Ritzman (*loc. cit.*) University of New Hampshire, Durham, U.S.A., says that the consumption of concentrate feeds in New England is about 2.2 million tons; and he discusses the digestibility and use of available food proteins, including yeast, on the basis of nutrition experiments in the Nutrition Laboratory of the New Hampshire Agricultural Experimental Station.

Finally, E. Craseman and others (*loc. cit.*) describe results of pig-feeding tests Animal proteins cannot be entirely omitted, and a mixture of 60 per cent wood sugar yeast with about 33 per cent animal protein is recommended.

Radio Active Materials

New Palestine Act

THE Palestine Administration has just introduced legislation controlling the prospecting for and mining of radio-active minerals, and their export and use. Despite the rulings of the Mining Ordinance and the Oil Mining Ordinance of 1938, no person may now prospect for or mine any radioactive mineral, except in accordance with the conditions of the High Commissioner's licence.

Persons granted the necessary licence must submit a monthly report of mining and prospecting operations to the Chief Secretary and the Controller. If minerals are found by an unlicensed person they cannot be removed without the consent of the Government. Infractions will be punished by two years in prison or a fine of £500—or both.

Materials Now Controlled

The materials controlled by the new Ordinance include any mineral containing uranium or thorium; minerals of the pitchblende group, including pitchblende, uraninite, ulrichite, broggerite, cleveite, and related mineral species; torbernite and autunite; secondary uranium minerals, including rutherfordine, uranite, uranophane, gummite, thorogummite, uranocircite, kasolite, becquerelite, and other silicates, hydrates, carbonates, phosphates or arsenates of uranium; carnotite; uranium-bearing niobate-titanate-tantalate ores, including euxenite, polycrase, blomstrandine, priorite, samarskite, fergusonite, betafite, plumboniobite, and related mineral species containing uranium oxide; and monazite, thorite, thorianite, and radio-active zircon.

American Chemical Notebook

From Our New York Correspondent

A POTENT force in combating commercial isolationism in the U.S. is the Twentieth Century Fund controlled by a realistic group which has studied world economic conditions and is doing its best to convince Americans of the necessity of reciprocal trading. The Fund has now released a highly interesting documentary film called "Round Trip: The U.S.A. in World Trade," through which audiences are being told in no uncertain terms that economic isolationism does not pay. In substance, the film declares that the people of the United States are paying out billions of dollars extra a year for goods which could be produced more efficiently and cheaply abroad. "These are the things we should make up our mind to import and concentrate our own efforts on agricultural and industrial products that we can turn out more efficiently than anyone else," says Dr. Winfield W. Riefler, of the Institute of Advanced Study, Princeton, New Jersey, who appears in the film. It will be used as a spearhead in a national campaign on world trade. The Advertising Council, the Junior Chamber of Commerce, the U.S. Department of Commerce and the League of Women Voters are among those groups which will use "Round Trip" to launch educational campaigns on America's rôle in foreign trade.

* * *

The Manufacturing Chemists' Association has just published Chemical Safety Data Sheet SD-15 on acetic anhydride, the fifteenth in the series of chemical product safety manuals being prepared by them. Designed for supervisory staffs and management, the manuals offer essential information for the safe handling and use of chemical products. Each lists the physical and chemical properties of the product, best shipping containers, container storing and handling and recommends personal protective equipment. The present safety data sheet on acetic anhydride is being distributed by the association, 608 Woodward Building, Washington 5, D.C., at the equivalent of 1s. per copy.

* * *

U.S. superphosphate production of 712,600 short tons in July this year was the lowest in any month, but was still 15 per cent above the figure for July, 1946. Total supply for the month exceeded 1,400,000 and was 12 per cent above June, 1947, and 21 per cent above July, 1946. July production of concentrated superphosphate fertiliser of 33,810 short tons was a gain of more than 3000 tons over the level of the previous month and almost 50 per cent more than was produced in July, 1946. This output, plus record high stocks of more than 58,000 tons on hand at the beginning of the month, brought the supply of the material for the first time above 90,000 tons.

* * *

Shortages of iron and steel are causing considerable concern to labour and industry in the U.S.A. The War Department's recent announcement that it plans to accelerate the flow of iron and steel scrap from its depots is a helpful and co-operative step. The War Department expects to supply approximately 500,000 tons of scrap by July, 1948, through the release of obsolete or obsolescent ammunition. To speed the output of scrap, the Secretary of War has appointed the Civilian Foundry and Scrap Industries' committee to serve with the War Department in an advisory capacity. Government agencies are believed to possess between two and three million tons of potential scrap in warehouses and in the form of war materials to be declared surplus and which it is believed will ultimately be offered as scrap. The total includes upwards of 300,000 tons of scrap in Europe under Army control.

* * *

Production of inorganic chemicals in the U.S.A. during the month of July declined slightly in comparison with June but maintained a relatively high level, according to the Bureau of the Census, Department of Commerce. A survey of 35 industrial chemicals disclosed that 19 were produced in lesser volume in July than in June, and only nine were produced at a lower rate this July than in July, 1946.

Chemicals whose production fell in July but held up well above a year ago include the acids—nitric, phosphoric (except from phosphate rock) and sulphuric-chlorine, oxygen, caustic soda and salt-cake. Those whose production fell below July, 1946, were: chrome green and molybdate chrome orange, dibasic calcium phosphate, lead arsenate, silver nitrate, sodium bicarbonate, and natural methanol. Record high production of carbon dioxide (liquid and gas and solid), natural soda ash, and phosphoric acid from phosphate rock was achieved during the month. Calcium arsenate and hydrogen were produced in larger quantity this July than during any month in several years.

* * *

Beginning this month, a substantial increase in the supply of Toxaphene, chlorinated camphene, will be available for 1948 agricultural insect control, according to the Hercules Powder Company which manufactures the product at its Brunswick, Georgia, naval stores plant. Preliminary results of large-scale field tests being conducted by the U.S. Department of Agriculture and State Agricultural Experimental Stations have confirmed earlier findings showing that Toxaphene is effective against cotton insects, grasshoppers, and other agricultural insect pests. Increased production will be aided by the completion early next year of an expansion of plant facilities which will more than double the present rate of production.

* * *

An important development in the field of organic chemistry has just been announced by Dr. Howard E. Fritz, vice-president in charge of research of the B. F. Goodrich Company, Akron, Ohio, marking the successful completion of research work on a new organic chemical material known as beta-propiolactone, which promises to become as important as acetylene or chlorine. Experimental production of this new material is under way. Described at the recent national meeting of the American Chemical Society as " another fundamental tool in the complex science of manufacturing organic chemicals," its use as a basic chemical is stated to make possible for the first time in chemical history the commercial production of a series of organic chemicals hitherto regarded as laboratory curiosities. Substances which may be made from the new material are said to range from the liquid used in setting permanent waves to materials used in leather processing. Other fields in which it is expected to contribute either better or more economical products include: compounds for preserving fats and oils; thermo-setting resin products, which can be made tougher and less brittle; plant-growth initiators and mould-growth inhibitors; synthetic fungicides; selective weed-killers; and intermediates for the paint industry. Fundamentally, the method of manufacture of the new substance is through the combination of ketene and formaldehyde, Drs. Gresham and Jansen explained. The basic raw materials are coal and water, and ethyl alcohol, the latter derivable from grain, petroleum or coal. Manufacture of beta-propiolactone is now being carried out on a small scale at the experimental station in Ohio of B. F. Goodrich Chemical Company.

* * *

Formation of Winthrop-Stearns Inc., as a new subsidiary to integrate the major pharmaceutical interests in the United States of the parent company has been announced by Sterling Drug Inc., through James Hill, Jr., president. The new company, he said, will conduct the business hitherto carried on by Winthrop Chemical Company, Inc., now being liquidated, as well as the pharmaceutical operations of the Frederick Stearns & Company Division, Detroit, Michigan. A similar subsidiary to take over Winthrop and Stearns' Canadian business will be formed in the Dominion as soon as legal requirements are completed. Dr. Theodore G. Klumpp has been elected president of the new Winthrop-Stearns Inc., which will take over the extensive Winthrop manufacturing facilities at Rensselaer, N.Y., Glenbrook, Conn., and a newly-purchased plant at Myerstown, Pennsylvania.

* * *

A practical step to aid Great Britain in building up dollar credits and developing foreign trade between the United States and the United Kingdom is the keynote of the activities of the British Export Trade Research Organisation which maintains American offices at 1631 K Street N.W., Washington, D.C. Thus far, the organisation, which was formed by some 350 leading British exporting manufacturers after the end of the war for the purpose of obtaining trade information from other countries to assist the British exporter, has made some noteworthy contributions to solving the problem of foreign trade. The first step in this direction was the inauguration of a monthly publication to be called *British News—A Shop Window for the World,* to be issued by the trade research group and distributed monthly to some 10,000 American department, chain and mail order stores, wholesalers and big importers, telling them of the kinds of British goods available for export. The second was the announcement this week of a new free service designed to help American importers to find British sources for goods in which they are interested. The organisation is inviting inquiries from American importers, wholesalers, retailers and industrial buyers relating to all types of products where an overseas source of supply is required. The inquiries will be forwarded to the organisation's London office, 48 Dover Street, W.1, where they will be classified according to product and referred to British companies which have asked to receive such inquiries.

This is by no means a hit or miss affair, since American buyers are assured that their inquiries will be sent only to those British manufacturers in their field who have indicated that they are prepared to handle overseas orders. The British firms will reply direct to the American buyer. The British trade group has also arranged to assist United States businessmen visiting England to get in touch with British firms.

AMERICAN CHEMICAL SOCIETY SYMPOSIUM

Papers on Industrial and Engineering Chemistry

AT the recent meeting of the American Chemical Society some interesting papers in the symposium on unit processes in the division of industrial and engineering chemistry were read.

Messrs. Denton, Bishop and Nygaard, of the Socony-Vacuum Laboratories showed that by operating at the proper conditions, 2-nitropropane can be nitrated with nitric acid to give 2,2-dinitropropane, a valuable combustion modifier for diesel fuels. The optimum conditions are: pressure, 900 to 1200 lb. per sq. in.; temperature, 400° to 450°F.; molar ratio, one mole of nitric acid to one mole of 2-nitropropane when using 70 per cent nitric acid; space velocity, 1.0 Conversions per pass of 11 to 14 mole per cent of the 2-nitropropane charged were obtained under these conditions with ultimate yields of above 50 per cent. It was explained that for commercial exploitation more detailed yield and corrosion data are necessary.

Acetylation of Thiophene

A continuous process for the acetylation of thiophene was described by John Kellett and H. E. Rasmussen, also of the Socony-Vacuum Laboratories.

The liquid-phase acetylation of thiophene with acetic anhydride, giving acetic acid as by-product, it was pointed out, may be accomplished at temperatures of 100° to 400°F. by use of reaction times of from one hour to a few minutes, respectively.

A continuous process was described wherein essentially complete conversion of acetic anhydride to product was obtained in a single pass, charging two moles of thiophene to one of acetic anhydride. The reaction temperature was about 325°F. and the reaction time five minutes. The catalyst was a 1.3 per cent concentration, based on total charge, of 85 per cent orthophosphoric acid in homogeneous liquid phase with the reactants. The excess thiophene was recovered and recycled.

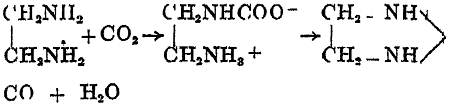
Ethylene Glycol Manufacture

The increased demand for ethylene glycol, chiefly for use as an antifreeze, has stimulated investigation of new methods of manufacture. One of these is based upon the vapour-phase oxidation of ethylene with air, followed by the liquid-phase hydration of the ethylene oxide to glycol in weakly acidic, aqueous solutions. In this investigation, "Vapour-Phase Hydration of Ethylene Oxide," R. R. Cartmell, J. R. Galloway, and J. M. Smith, a study was made of the possibility of carrying out the second step (the hydration reaction) in the vapour phase by passing ethylene oxide and steam over a solid catalyst, thereby eliminating the purification difficulties encountered in the acidic, liquid-phase process. Over a temperature range from 150° to 250°C. with acid-type catalysts, such as phosphoric acid on alumina, silica gel, thoria, etc., no glycol was obtained, although considerable quantities of aldehydes were formed in some instances. Silver oxide on an alumina carrier was found to be effective, conversions to glycol ranging from 20 to 30 per cent, with corresponding yield figures of about 80 and 40 per cent. The yield was affected by catalyst age, increasing to an approximately constant value of 80 per cent after about five hours of operation. The results suggest the possibility that with a new catalyst significant quantities of ethylene oxide are converted to a by-product which is held on the solid catalyst surface.

Synthesis of Ethylene Urea

In a paper on "The Development of a Process for the Synthesis of Ethylene Urea," John F. Mulvaney and Ralph L. Evans, of the Evans Research and Development Corporation, New York, point out that as it was apparent that large quantities of ethylene urea would be required as a chemical intermediate, an investigation of methods of synthesising it was begun in these laboratories in June, 1942, and completed in October, 1943.

Methods already described in the literature were tried but were ruled out on the basis of low yield and high cost. A new, general method for the synthesis of cyclic ureas was then developed. This reaction involves the conversion of a mixture of ethylene diamine and carbon dioxide, or the addition compound, ethylene diamine carbonate, to ethylene urea under the influence of heat and pressure.



$$\begin{array}{l} CH_2NH_2 \\ | \\ CH_2NH_2 \end{array} + CO_2 \rightarrow \begin{array}{l} CH_2NHCOO^- \\ | \\ CH_2NH_3{}^+ \end{array} \rightarrow \begin{array}{l} CH_2-NH \\ | \\ CH_2-NH \end{array}\!\!\!> \; CO + H_2O$$

A detailed study of this reaction on a small scale was made and the optimum conditions of temperature, pressure, and concentration of reactants were established. As a result of this study two processes, one a batch, the other continuous, were developed and carried through on a small pilot-plant scale. The process is surprisingly simple, easy to control, and requires no unusual or expensive equipment. Yields of 95 per cent and better may be obtained; operating pressures are in the range of 400 to 900 lb. per sq. in., while temperatures range from 200° to 230° C.

The cost of ethylene urea by this process was approximately the same as the cost of the raw material, ethylene diamine.

Fluorine-Initiated Chlorination

In a report on chlorination initiated by fluorine, E. T. McBee and J. A. Bittles, of the Department of Chemistry, Purdue University, point out that it has been found that a small quantity of fluorine introduced into a mixture of chlorine and certain organic compounds will initiate chlorination. The method is applicable in both the liquid and vapour phase. For example, it was possible to achieve a high percentage chlorination of hydrocarbons when the organic material was dissolved in liquid chlorine.

The advantages of this method are readily apparent when considering the results obtained in the vapour-phase chlorination of ethane. A small stream of fluorine diluted with nitrogen was injected into a mixture of ethane and chlorine. The reaction could be carried out in an iron reactor at room temperature and be cooled by tap water if desired. By proper regulation of the fluorine, yields of chlorinated compounds between 95 to 100 per cent were obtained. These high yields were accompanied by a 95 to 100 per cent conversion per pass which made this specific process attractive. Besides ethyl chloride, there was formed a small quantity of dichloroethanes and a trace of trichloroethanes. The process was limited by the quantity of fluorine required for maximum yield and conversión; however, it has been found to date that a fluorine to chlorine ratio as small as 1 to 20 could be employed with satisfactory results.

Residual Fluorine Gas Disposal

In the symposium on fluorine chemistry a commercial plant for the disposal of residual fluorine gas admixed with hydrofluoric acid gas and nitrogen was described by R. Landau and R. Rosen, Standard Oil Development Co.

The process is a continuous one in which strong caustic soda was used as the absorption medium and the regeneration of caustic was accomplished by continuous treatment with lime, thereby precipitating calcium fluoride which was periodically discarded. The fluorine content of the exit gas from the system was very low, and no safety or medical problems were involved.

Operating data were presented which demonstrated the smooth and simple functioning of the system largely under automatic conditions and with low labour costs.

Red Phosphorus Production

A paper by Philip Miller, R. A. Wilson and J. R. Tusson described a continuous process for the production of red phosphorus developed in the laboratories of the Tennessee Valley Authority and which shortens the time required for conversion of white phosphorus to red phosphorus from days to hours over the commercial batch process. During the war a pilot plant embodying the continuous process was built and operated to produce red phosphorus of high purity for the War Department. In this process liquid white phosphorus was maintained continuously at its boiling point in a reaction vessel with a retention period of 5 to 6 hours, which converted from 30 to 50 per cent of it to solid red phosphorus. The resulting slurry overflowed continuously into a heated screw conveyor in which it was carried countercurrent to a stream of hot inert gas. The white phosphorus was vaporised and carried to a condenser, to be collected and recycled. Finely divided red phosphorus was discharged as the product and did not require treatment with boiling caustic or grinding, as in the batch process.

An additional advantage of the continuous process is its suitability for obtaining a product of high purity, needed in certain military applications.

POLISH CHEMICAL PRODUCTION

During the first six months of 1947 the Polish chemical industry achieved a production valued at £23,407,500, the major fields being:

Rubber articles	6,282,500
Artificial fertilisers ...	4,060,000
Organic chemicals ...	2,307,500
Inorganic chemicals ...	2,207,500
Coal derivatives	2,117,500
Oils and fats	1,407,500
Paints and colours ..	1,272,500
Explosives	1,207,500
Pharmaceuticals ...	885,000
Technical gases ...	745,000

Principal exports in the same period were carbide, caustic soda, arsenic, sulphur, ammonium chloride, zinc white, tar and dyes. These were shipped to U.S.S.R., Czechoslovakia, Jugoslavia, Bulgaria, Hungary, Sweden, Finland, Denmark, Holland, Switzerland, Argentina, Brazil, Palestine and the Russian zone of Germany. Artificial fertiliser production reached 370,000 tons of which 187,000 tons were nitrogenous and 183,000 tons phosphoric.

NEW PATENT PROCESS

HIGHER PRODUCTION OF GUANIDINE NITRATE

IMPROVED methods in the manufacture of guanidine nitrate are claimed by Koppers Co. Inc., in English patent 18857/1947, which deals particularly with the use of ammonium thiocyanide as starting material. Previous attempts had given yields of only about 50 per cent and in reacting the ammonium thiocyanide directly with the nitrate in molten admixture—whereby 100 · per cent yield might be expected—there was risk of serious explosion. In the present invention this risk is eliminated and yields higher than 50 per cent are possible.

The method consists in reacting ammonium thiocyanide and ammonium nitrate in anhydrous ammonia solution at temperatures between 120 and 210° C. The reaction is presumed to be as follows:

$$NH_4SCH + NH_4NO_3 + NH_3 = CN_3H_5NO_3 + H_2S + NH_3$$

Explosion, within the temperature range used, is believed to be prevented by the ammonia blanket which remains in the system during reaction.

The hydrogen sulphide may be eliminated in many ways, *e.g.*, by stopping the reaction after a certain stage; separating sulphide and ammonia from guanidine nitrate, and then the ammonia from sulphide; and returning ammonia to reaction mass for further production of guanidine nitrate. Or excess ammonium nitrate may be used so that hydrogen sulphide is oxidised to elemental sulphur. Reaction time varies, according to conditions, from 2 to 24 hours. If excess ammonium nitrate is used, a lower temperature is preferable, otherwise the guanidine nitrate may be decomposed. Operation may be either batch or continuous, using an autoclave.

Differing Solutions

Ammonium thiocyanide and ammonium nitrate are both soluble in ammonia and form the well known Divers solutions. As an example, ammonium thiocyanide and at least equal molecular proportions of ammonium nitrate are dissolved in ammonia equal in weight to about half that of the two salts, placed in autoclave and heated. At completion of reaction the charge is allowed to cool, preferably in ice-water, then removed from the autoclave, and guanidine nitrate is crystallised out and filtered. The solution is then evaporated for removal of hydrogen sulphide and ammonia.

The recovered ammonia and residual unchanged salts may be returned to process. Pressures attained range from 130 to 275 lb./sq. in. Yields vary from 19 to 53 per cent, the lower figure being obtained with temperature down to 175°C. and pressure just under 200 lb./sq. in.

[In connection with this use of ammonia it is of interest to recall a recent discussion at Stanford Universty when reference was made to the increasing use of liquid ammonia as medium for chemical reactions, and especially to ammonolysis or reduction in ammonia solution. The case of nitroguanidine reduced to amino-guanidine was cited, together with others, by Dr. C B Wooster, chemical director of Ciba Products Corporation.—*Edit. Note.*]

NEW SCREENING METHOD

I.G. FARBEN INNOVATION

FREEDOM from grit is one of the essential requirements of organically-produced slurries, such as vat dye paste for printing. In printing, for example, the presence of hard particles of metal, glass or sand would damage expensive copper printing rolls. At the I.G. Farbenindustrie plant, Leverkusen, Germany, a novel screening device, said to be superior to vibrating screens, jet screens, fine grinding mills, and decanting equipment, has been developed for removing grit and coarse particles from slurries of organic chemicals. The operating characteristics and design details are fully described in a report just placed on sale by the Office of Technical Services, U.S. Department of Commerce, Washington.

Method of Operation

The device, mounted on a portable frame, consists of a vertical cylindrical metal vessel or bowl in which an inner concentric ring of fine screen is rigidly fastened. Inside the screen cylinder, a top-driven, close-fitting four-bladed impeller is rotated at variable but relatively high speeds. When the slurry is fed into the top of the inner screen cylinder, the impeller forces it through the screen partition into an outer collecting bowl from which the slurry flows into any convenient receptacle. The grit and coarse materials settle to the bottom of the inner receptacle. At the I.G. Farben plant the average output is said to be 1000 kilograms of screened slurry per hour.

The report, No. PB-77678 entitled "Screening Device for Slurries of Organic Chemicals," consists of eight mimeographed pages with two detailed drawings and is priced 50 cents.

Oxygen Speeds Steelmaking

Total Output Increased

THE use of oxygen in open-hearth furnaces as a means of stepping up U.S. production of steel is a subject of increasing interest and discussion among U.S. experts. Further light on the subject was provided at the recent convention of the Association of Iron and Steel Engineers held in Pittsburgh, the U.S. steel centre.

J. H. Zimmerman, of the Linde Air Products Company, New York, described intensive tests that have been made in many mills during the past year on the use of oxygen to speed up combustion of fuel, increase furnace temperatures and reduce the time required to melt scrap. Oxygen also has been bubbled through the molten bath in the furnace, it was reported, to speed carbon reduction and finish heats more quickly.

John Hornak, of the Carnegie-Illinois Steel Corporation, described experiments at his company's Homestead Works which indicate that the use of compressed air, rather than oxygen, provides similar results more economically

The wider use of oxygen in steel manufacturing depends on the production of the gas at a reasonable cost, H. W. McQuaid and F. E. Pavlis, of Air Products, Inc., Allentown, Pa., said. They reported that oxygen generators are now available to meet the needs of steel plants and declared that new developments have reduced prices to the point where oxygen may be used profitably in steel mills.

From 15 to 20 Tons

Meanwhile, in Cleveland, Ohio, the Republic Steel Corporation reports that by injecting oxygen gas into its open hearths it can raise production of steel from the normal 15 tons to 20 tons per hour. The "heat" time has been reduced with oxygen from the eleven to twelve hours by conventional methods to less than eight hours in experiments. Five more of the company's big 200-ton capacity open hearths have been equipped to use the gas, and other steel companies are engaged in similar experiments.

According to James L. Hyland, Republic's Cleveland district manager, several obstacles still remain to be overcome, but there is no question that oxygen can play a major part in speeding up production. He also said that the use of gas cuts the life of open-hearth roof refractories by about half. The cost of oxygen would have to be reduced to something under 25 per cent of its current price if its use is to be greatly expanded in steel-making.

Official Notices

Fertiliser Prices Rise

The following increases in the permitted maximum prices of fertilisers, to cover increased transport charges, are announced by the Board of Trade, with effect from October 4. Per ton—Sulphate of ammonia, 5s.; basic slag, 3s. national compounds, 3s.; c.c.f., 8s.; ground phosphate, 3s.; superphosphate, 3s. The increases in Northern Ireland *ex* "port place" or producer's works are: sulphate of ammonia, 5s.; basic slag, 3s.; superphosphate, 3s. The changes are authorised by S. R. & O. 1947, No. 2113.

Control of Iron and Steel

With effect from October 1 last, the Minister of Supply has made the Control of Iron and Steel (No. 60) (Scrap) Order, the Control of Iron and Steel (No. 61) Order and the Control of Bolts, Nuts, Screws, etc. (No. 14) Order. These Orders increase maximum prices for scrap iron and steel and most iron and steel products consequent upon the increases in freight rates and in the prices of coal and coke. Details of the new scales are contained in S. R. & O.s Nos. 2095, 2096 and 2097, 1947.

Duties Suspended

The Treasury has made an Order under the Finance Act, 1926, exempting alcohol furfuryl, and the ethyl ester diethyl sulphate (ethyl sulphate) from Key Industry Duty for the period October 4-December 31, 1947. The Order is entitled The Safeguarding of Industries (Exemption) (No. 7) Order, 1947 (S. R. & O. 1947, No. 2091) (H.M.S.O., 1d. net).

German Soap and Fats.—The Deutsche Fettsäure-Werke, Witten, formerly Imhausen & Co., has recently taken up manufacture of fatty acids. For the time being, 600 tons will be produced each month. The Krupp Motor Fuel Works at Wanne-Eickel is supplying the paraffin residue. Fats for technical purposes and soap manufacture are being produced initially together with limited quantities of edible fat. The firm of Julius Richter, jr., Bergisch-Gladbach, British zone, manufacturers of chemical-technical goods, mainly soap and soda, have been granted the so-called "great permit." It is now working at 80 per cent capacity and employs 300 workers. The O. Neynaber & Co., A.G., Bremerhaven, has commenced the manufacture of soap in co-operation with the firm of Gebr. Albrecht, Bremen. Manufacture of olein, stearine and cod-liver oil has been re-introduced.

TETRA-ETHYL-LEAD

NEW METHOD FOR DETERMINATION IN AIR

IT is well known that the vapour of tetra-ethyl-lead is highly toxic. Some authorities give the maximum permissible concentration in air as 0.01 mg. per 1 cu. m. It is necessary, therefore, that methods for determining it should be both accurate and sensitive. A new method of determining tetra-ethyl-lead in air given in the Russian journal *Gigiena i Sanitariya* (1945, 10, No. 9, 17-21), satisfies both conditions.

Existing methods of determining tetra-ethyl-lead, whether in fuels or in air, depend upon the decomposition of the molecule followed by a determination of the lead ion. Decomposition is attained by means of one of the halogens, or concentrated acid, or by a photochemical or thermal process. There are, however, objections to all the methods hitherto described. They involve a large number of operations and the possibility of errors at each stage. The best method appears to be that based on decomposition with alcoholic iodine solution. It is preferable to alcoholic bromine solution which is likely to be contaminated with sulphate and other impurities, while the action of chlorine in alcoholic solution is so vigorous that overheating and consequent loss may easily occur.

Too Complicated

Of the normal methods of determining lead, the dithizone method is most sensitive, allowing 0.001 mg. to be determined, but the necessary purification of the reagents is difficult, and the method appears too complicated under routine conditions. The molybdate method is sensitive to 0.005 mg. of lead, and the chromate and sulphide methods to 0.01 mg. of lead. In all cases, for determining tetra-ethyl-lead in air it appears necessary to carry out at the same time, identical operations with the sample and a standard, and the standard should preferably not be lead nitrate but a known amount of tetra-ethyl-lead.

In these methods two distinct operations are involved—decomposition of the tetra-ethyl-lead molecule, and determination of lead.

The new method is a direct determination; it is based upon the reaction with silver nitrate, whereby tetra-ethyl-lead, in large quantities, gives a copious black precipitate, and in small quantities, a yellowish brown colour, the intensity of which is proportional to the amount of tetra-ethyl-lead.

It is known that −80° C. silver nitrate reacts with tetra-ethyl-lead to give silver ethyl, as a very unstable compound:

$$Et_4Pb + AgNO_3 = AgEt + Et_3PbNO_3.$$

At −35° C. silver ethyl decomposes, giving metallic silver and free radicals. The application of the reaction to quantitative determination of tetra-ethyl-lead required a study of the effect of solvents. The author investigated various solvents and found that the most intense and clear colours were obtained in ethyl and butyl alcohols.

Results with Ethyl

With ethyl or butyl alcohol as a solvent it was found that: (1) the optimum quantity of 1 per cent aqueous or alcoholic silver nitrate to be added to 5 ml. of the alcoholic tetra-ethyl-lead solution is 0.05 ml., (2) addition of sodium hydroxide or aqueous ammonia solution in quantity insufficient to give silver oxide increases the intensity and brightness of the colour obtained; the sensitivity may be raised thus from 0.05 to 0.01 mg., (3) impurities, such as ethyl chloride and ethyl acetate, that may accompany the tetra-ethyl-lead in air, do not give the reaction and have no effect on it, (4) tetra-ethyl-lead vapour is easily absorbed by either ethyl or butyl alcohol; if the rate of flow of air does not exceed 40 litres per hour, and two absorbing vessels are used, the lead compound is absorbed mainly in the first absorbent, (5) tetra-ethyl-lead in the vapour state may be determined with an accuracy of ± 15 per cent.

Unsuccessful attempts were made to use a liquid solvent less volatile than ethyl or butyl alcohol, *e.g.*, glycerine and alcohol mixtures, petroleum jelly and butyl alcohol mixtures, dimethyl phthalate, and dibutyl phthalate. Silica gel was found to be effective in absorbing tetra-ethyl-lead, but the subsequent extraction gave incomplete yields, particularly noticeable when the amount absorbed was 0.1 mg. or less. Treatment of the silica gel containing the absorbed lead compound with alcoholic silver nitrate gave a brown stain but the colour was unevenly distributed over the surface. Previous treatment of the silica gel before use as an adsorbent with silver nitrate gave satisfactory results.

Purified silica gel was, therefore, ignited, soaked in 1 per cent alcoholic silver nitrate, then dried in the dark at room temperature, and packed into a glass tube, 4 mm. in diameter, and 70 to 80 mm. long. Small pieces of pure cotton wool were inserted at the ends. The silica gel so prepared darkens on being kept; it should therefore be used within a day.

When air containing tetra-ethyl-lead was passed through one of these tubes a yellowish brown ring appeared. Subsequent moistening with a few drops of ethyl alcohol developed a more intense brown colour.

Less British Machinery for Industry

Chemical and Textile Plant Excepted

THE Government's export plans were discussed by Mr. John Wilmot (then Minister of Supply), when he addressed members of the Engineering Advisory Council last week. Steel allocation to individual firms, he said, would be made on the basis of export performance, a policy which would have the effect of increasing restriction on machinery supplies for re-equipping home industries. There would also have to be some statutory form of output return from individual firms since the present voluntary system had proved itself inadequate.

Reviewing the progressive export targets for the engineering industry recently announced by Sir Stafford Cripps, and including such items as instruments, electrical goods, refrigerators, vehicles, ships, and rubber tyres, Mr. Wilmot said that the programme called for an increase in exports from £30 millions per month in the last quarter of 1947 to £42 millions per month in the mid-summer of next year, and £48 millions per month by the end of that year.

Turning to the question of iron and steel supplies to the engineering industry, the Minister said that while there would have to be increases to match the size of the export targets, any increase in *total* supplies were quite out of the question. " Increases in supplies of steel for export purposes," he continued, " will to a large extent have to be offset by a restriction in supplies for home production, including particularly capital goods of all kinds, building, civil engineering works and machinery. Having regard to the clamant needs of the undermanned industries such as textiles we cannot budget for an increase in output over the engineering industries as a whole, except such as will arise, we hope, from increased productivity and efficiency, for we cannot count on a much increased labour force in the engineering industries."

With regard to the field of specialist machinery, Mr. Wilmot agreed that the position here was more complex. In recognition of the fact that Britain had no alternative but to retrench heavily in capital investment, in many of the machinery using industries, desirable measures of re-equipment must be postponed or slowed down. " The extent of this diversion of output from home to export will vary of course with the different types of machinery," he continued, " and in the priority industries such as heavy electrical plant and coal mining machinery.

" Whatever programmes are fixed to meet home requirements will continue to be a first charge on output. In some other cases also certain types of textile machinery and chemical plant, home supplies of which would indirectly make an early and significant contribution to export in the hands of the textile and chemical industries—themselves most important export industries—we shall have to be particularly careful to find the best balance between home and export But over much of the field, increased restriction in machinery supplies for the re-equipment of home industries is inevitable."

TETRA ETHYL LEAD (*Cont. from page* 505)

In any case the colour was much more intense than that obtained with untreated silica gel. The sensitivity with treated silica gel is such that 0.001 mg. of tetra-ethyl-lead may be detected after final moistening with alcohol; with untreated silica gel the amount has to be 10 to 100 times this to be detectable.

For quantitative purpose a series of standards was prepared. With 0.001 to 0.01 mg. of tetra-ethyl-lead, steps of 0.002 mg. showed distinct differences; with 0.01 to 0.07 mg., steps of 0.02 mg. were distinguishable, but with quantities of over 0.07 mg., the intensity was so great that no quantitative evaluation was possible. The standards were unstable, however, and artificial standards of water-colours on paper were prepared for greater convenience.

To determine amounts of the order of several hundredths of a mg. in 1 cu. m., the passage of 100 litres of air is necessary but the result is obtained by direct visual comparison with standards. With mg. and tenth mg. quantities the time required for a test is 5 to 15 minutes. The method is not applicable in the presence of carbon monoxide.

New Petrol-Rationing Proposal

An alternative to the abolition of the basic petrol ration was proposed last week by Sir Miles Thomas, president of the Society of Motor Manufacturers and Traders. The scheme consists of allowing a much-reduced ration (of say half) sufficient to permit the motorist to operate his car within a 15-mile radius from any given point, such a centre being clearly mentioned in the ration book by the issuing authority.

Sir Miles claims that his plan is self-recommending since any policeman could check up on a motorist's activities at any time. Further advantages are that cars used for travelling to business could continue to be so used, and the housewife enabled to do a certain amount of shopping.

Micro-Analysis in Wartime Germany

" Semi-Automatic " Equipment

THE Germans, during the war, made no revolutionary advance in micro-analytical methods, but they introduced some modifications in quantitative analytical procedure which are worthy of study. This is the conclusion reached in the B.I.O.S. Final Report on micro-analytical methods (No. 715, Item 22; 1s. 1d., post free) based on very full information supplied by Dr. Karel Tettweiler, who was in charge of the analytical laboratories of I.G. Farbenindustrie at Elberfeld-Wuppertal.

As regarded laboratory and equipment in use, the laboratory was kept at a thermostatically controlled temperature of 20°C. The microchemical balances, mounted on the usual concrete shelves with dust-proof cases, were illuminated by tubular fluorescent lamps.

Tubular furnaces for combustion tubes were switched on automatically one hour before the staff arrived, so that work might commence without any delay. These furnaces were thermostatically controlled. The combustion tubes were all made from quartz and the movable heaters were moved automatically at an uniform rate.

Each apparatus had an arrangement whereby a bell rang when the movable heater reached the long burner so as to call the attention of the analyst, who then proceeded with the next step in the estimation.

Most of the modifications used in this laboratory are stated to be based on the time-saving methods recommended by Dr. Zimmermann, of the I.G. Ludwigshafen. In these methods, the personal element is reduced to a minimum in order that any one of assistant grade, possessing average ability, could quickly become proficient in carrying out analyses.

A number of methods are briefly described in this report, while full details may be found in the following journals: (i) The automatic micro-analytical estimation of carbon and hydrogen in industrial laboratories. W. Zimmermann, *Mikrochemie*, **31,** 149 (1943). (ii) The gasometric estimation of nitrogen in organic compounds. H. Gysel, *Helv. Chim. Acta*, **22,** 1088 (1939). (iii) The estimation of chlorine in organic compounds. The type of combustion tube used for this estimation—the substance is decomposed in the usual way either in a combustion tube or by the wet oxydation method of Zacherl and Krainick—is described by Wurzschmidt and Zimmermann, *Z.f. analyt. Chem.*, **114,** 6450 (1938). This tube is also used for the estimation of sulphur in organic compounds. (iv) The estimation of oxygen in organic compounds. J. Unterzaucher, *Ber.*, **73,** 391 1940). (v) The estimation of acetyl groups in organic compounds. E. Wiesenberger, *Mikrochem.*, **30,** 241 (1942).

CYANAMIDE AND MELAMINE : THE FRENCH PROCESS

IT is widely known that solutions of cyanamide can be obtained from suspensions of calcium cyanamide in water by precipitating with carbon dioxide or sulphuric acid, and distilling off the water. But there are various disadvantages including impurity of product. Now, by an invention of the *Soc. Anon. des Manufactures des Glaces et Prod. chim. de St. Gobain, Chauny, and Cirey* (English Patent 4000/1947), it is possible to obtain good yields of high purity cyanamide, dicyandiamide, or melamine, from solutions of cyanamide. Melamine may be obtained directly from cyanamide without passing through the intermediate dimer stage.

Calcium cyanamide in aqueous suspension, in the French method, is treated with sulphuric acid, carbon dioxide, or organic solvent or mixture thereof, and distilled *in vacuo* to eliminate water; it is then heated, and separated by filtration. The extract may be distilled at temperatures between 80° and 130°C., and dicyandiamide separated; or heated to 130°-300° C. and melamine separated.

Such solvents may be alcohols, ether oxides or salts, ketones, acids, etc. Polymerisation may be effected in the presence of auxiliary materials such as ammonia or amines, and operation may be batch or continuous.

Several examples are given, *e.g.* 200 kilos calcium cyanamide in powder form are placed in suspension in 1500 litres of water. Carbon dioxide is introduced, and the suspension agitated and cooled down to 40°C. or less. The carbon dioxide supply is stopped, and the *p*H should be such that bromothymol blue turns green.

The suspension is transferred to an extraction vessel where butanol—with carbon dioxide for agitation—is provided. By regulating the supply of butanol, cyanamide may be obtained at top of column. This solution is heated and distilled at slightly reduced pressure and at a temperature of 100°C. 47 kilos of crystalline dicyandiamide is thus obtained. The butanol may be used again continuously.

NEXT WEEK'S EVENTS

MONDAY, OCTOBER 13

Manchester Literary and Philosophical Society. Reynolds Hall, College of Technology, Manchester, 5.30 p.m. Dr. F. L. Rose: "New Anti-malarial Drugs."

TUESDAY, OCTOBER 14

Institution of Civil Engineers. The College, Library Street, Wigan, 7 p.m., Mr. A. Monk: "Open-cast Coal Production."

Royal Institute of Chemistry (London and S.E. Counties Section). County Technical College, Essex Road, Dartford, 7.15 p.m. Discussion on local activities. H. Baines: "The Chemist and the Photographic Industry."

British Sales Promotion Association. The Charing Cross Hotel, London, W.C.2, 6.30 p.m. Mr. L. D. Stewart, Home Sales Manager, Paints Division, I.C.I., Ltd.: "Planning of Sales Areas."

Institution of Chemical Engineers. Institution of Mechanical Engineers, Storey's Gate, St. James's Park, Westminster, S.W.1, 5.30 p.m. R. V. Southwell: "Relaxation Methods: A Mathematics for the Engineer" (Sixth Hinckley Memorial Lecture).

WEDNESDAY, OCTOBER 15

British Association of Chemists (Manchester Section). Engineers' Club, Manchester, 7 p.m. Mr. N. Sheldon: "Economic Security in the Chemical Profession."

Institution of the Rubber Industry (Southern Section). The Polygon Hotel, Southampton, 7.15 p.m. Dr. W. J. S. Naunton: "The Past, Present and Possible Future of Rubber Accessory Substances."

Society of Chemical Industry. Burlington House, Piccadilly, W.1, 6.30 p.m. The first meeting of the 1947/8 session. Mr. N. J. L. Megson: "Molecular Structure and its Influence on the Properties of the Phenolic Plastics."

Society of Chemical Industry. Chemistry Lecture Theatre, King's College, Newcastle-upon-Tyne, 5.30 p.m. Symposium on "Emulsions, Dopes and Paints." J. S. Gourlay: "Some Industrial Applications of Rheology"; T. Adamson and J. R. Stephenson: "A Brief Survey of Emulsions in the Surface Coating Industry"; J. Pryce-Jones: "On the Rheological Classification of Suspensions."

Institute of Welding (North London Branch). Enfield Technical College, Queensway, Ponders End, Enfield, 7.30 p.m. Mr. R. R. Sillifant: "Argon Arc Welding."

Royal Institute of Chemistry. Town Hall, High Holborn, W.C.1, 6.30 p.m. Mr. L. N. Coombs: "Personnel Selection."

THURSDAY, OCTOBER 16

Society of Chemical Industry, Chemical Society and **Royal Institute of Chemistry** (Liverpool Sections). Chemistry Lecture Theatre, University, Liverpool, 7 p.m. R. R. Butler: "Some Aspects of Industrial Administration."

The Chemical Society (Edinburgh Section). North British Station Hotel, Edinburgh, 7.30 p.m. Professor W. Wardlaw: "Modern Ideas of Valency."

Oil and Colour Chemists' Association. Royal Institution, 21 Albemarle Street, London, W.1, 6.30 p.m. Sir W. Lawrence Bragg: "A Review of Recent Advances in X-ray Analysis."

DUTCH QUININE FOR U.S.

The Amsterdam "Kina Bureau," central selling agency of numerous planters and manufacturers of cinchona, has recently offered the Reconstruction Finance Corporation (U.S.) 2.1 million oz. of quinine at a price not much above the pre-war level. At the same time it has become known that the export of cinchona bark from Ecuador—during the war the U.S. developed plantations and received large supplies from the Foreign Economic Administration (formerly U.S. Board of Economic Warfare)—has very much dwindled.

Last year it amounted to only 28.436 kg. compared with 827.886 kg. in 1945. Even of this reduced export, 55 per cent went to Holland, whereas in 1945 practically the total export was directed to the U.S. The above-mentioned offer will go a long way to meet the protests of well-known American pharmaceutical manufacturers against their "withholding" from the Cinchona Ledgeriana plantations of Java and the monopolistic policy of the Dutch in this field. Some of these manufacturers had urged Washington officials not to grant Holland any financial aid until U.S. buyers were allowed free access to the cinchona sources of the Preanger (Java). The American Government was further urged to maintain firm control over the import of this commodity.

"Enterprise Scotland" Closing Date.—The closing date of the "Enterprise Scotland" exhibition has been announced by Sir Steven Bilsland, chairman of the exhibition committee. Originally timed for September 30, the closing date has now been fixed for Saturday, October 18

South African Chemicals

Good Prospects for Paint and Fertilisers

From Our Cape Town Correspondent

THE rapid development of South Africa's home chemical industry is reflected by a number of recent announcements and events in the Union. A typical example is the news that when the extension of the African Explosives and Chemical Industries' Natal plant is finished next year—at a cost of about £1 million—the plant will produce around 1000 tons of fertiliser daily and it will provide annually some 320,000 tons of superphosphate, four times the amount manufactured in South Africa in 1939. Total present output from all South African sources is less than 150,000 tons a year.

Other evidence of the continuing development are the statements that the new factory of the Capital Match Corporation, Ltd., at Bloemfontein will be in production possibly by the end of this year, and by the Shell Oil Company that it is now paying over £2 million a year to the Union Government in Customs duties and nearly £1 million to the South African railways.

Scope for Settlers

The Shell Company depends almost exclusively on South Africans for its staff—99.51 per cent are Union nationals—but in other spheres recent settlers are finding spenty of scope, especially in the development of newer techniques. This is fairly marked in the paint industry, which is now receiving some of the new machinery, much of which has been on order for upwards of three years.

Among the British settlers who have recently arrived in the Union are men with expert knowledge of the paint industry. Some of the laboratory chemists now employed in South Africa have arrived in this country since the end of the war. The industry is, however, still suffering a serious handicap in the shortage of raw materials, which are still hard to import, and supplies of tinplate are still scarce, as the bulk has to be earmarked for the food industries.

It is now hoped that most of these troubles will have been overcome next year. The general feeling is that as soon as all controls are lifted from the building industry there will be a building boom in South Africa in which the paint industry will share.

Higher Rhodesian Mineral Output.—The value of Rhodesian production of copper, zinc and lead and other minerals during the first six months of this year amounted to £12,848,604 as compared with £7,422,498 in the same period of 1946. Individual figures were as follows: Copper (blister and electrolytic) £11,495,238; zinc, £633,000, and lead £461.700.

St. Rollox Chemical Works

Its Contribution to Glasgow's Development

AN interesting talk was given by Mr. Ernest W. D. Tennent, joint managing director of C. Tennent Sons & Co., London, when he gave the second Tennent memorial lecture to the Glasgow section of the Society of Chemical Industry in that city recently.

He spoke of the old St. Rollox Chemical Works, now celebrating its 150th anniversary, which, he said, had contributed to the industrial development of the city of Glasgow. When the concern was first established at St. Rollox it lay in complete isolation, but it was now only a part of a large and busy industrial area.

Since 1840

Tracing the early history of the firm, Mr. Tennent said that by the year 1840 the works at St. Rollox were recognised as the most extensive and most important in Europe. For a time the works at Hebburn-on-Tyne had represented a challenge, but by 1875 the factories at St. Rollox had been extended by more than 50 acres. Exclusive of coal, more than 80,000 tons of raw materials were used per annum. An interesting production feature was that, while the annual output of bleaching powder rose to 10,000 tons, the price fell from £140 per ton to £8 10s. per ton. For 50 years the company's greatest rival had been Brunner Mond & Co., Ltd., but this rivalry ended when both firms were absorbed into Imperial Chemical Industries, Ltd. When the present race of Tennents had passed away, said Mr. Tennent, it would have left its name indelibly imprinted not only upon the history of Glasgow, but upon that of the social progress of the nation.

Five Generations

The passing of the old Chemical Works into other hands did not mean the end of the old Tennent companies, but rather freed them to embark upon other ventures, and the old companies in Glasgow, London, Liverpool, Belfast and Dublin were still expanding and flourishing.

Mr. E. W. D. Tennent, who represents the fifth generation in the family's business undertaking (his son, who has recently come into the business, is the first of the sixth), concluded his lecture by stating that if Government interference did not crush private enterprise, he had hopes that the various Tennent concerns would continue for another 150 years.

Alum-Earth Plant in Hungary.—One of the big investments in Hungary's three-year plan is the establishment of an alum-earth plant at Almasfüzitö in the Danubian region.

Scientifically Controlled Plastics Production

New Principles Applied at a Tynemouth Factory

THE factory newly completed by De La Rue Insulation, Ltd., at West Chirton, Tynemouth, represents development at a level seldom reached before of the principles of automatic control of vital processes and of automatic recording which permits consultation at any time of all the relevant conditions in which a particular batch of insulating material was produced.

The value of such records and controls in providing the fullest data about processes and procuring absolute uniformity of production is reflected by the fact that many thousands of pounds have been spent on the instrumentation alone.

Varied Plastics Products

The factory, which has now started production, was completed by Sir Robert MacAlpine & Sons in just over two years. It is a major enterprise covering 170,000 sq. ft. and is devoted to the expanded production of laminated plastic materials, "Formica," "Traffolyte" and "Delaron," with departments for the manufacture of plastic extrusions, insulated sleevings and electrical connecting wires.

The specification and engineering of the equipment were the result of co-operation between De La Rue's technical department, Mr. K. W. West, of the Bristol Instrument Co., Ltd., and the various plant contractors, Carrier Engineering Co., Ltd., W. J. Fraser & Co., General Engineering Co., Ltd., L. A. Mitchell, Ltd., and J. Shaw & Sons, Ltd.

The important and characteristic development is the incorporation in all the plant of recorders which automatically and continuously record over a period of 24 hours the conditions of temperature and pressure in the various parts of the plant, so that at any time a check can be made as to the actual conditions under which any given piece of material was processed.

On the 100-ft. long impregnating machine the paper or fabric first passes through a pre-drying chamber, the temperature of which is automatically controlled, to ensure that the material is in an ideal state to receive the impregnating resin.

The material then passes through a resin bath which is automatically temperature controlled by either a heating or cooling medium according to requirements to maintain within close limits the correct viscosity of the resin to suit the particular grades of resin and material.

It next moves into the oven proper which is automatically temperature controlled at several points along its length to maintain the required gradient of temperature for the correct processing of the resin impregnating material.

On the vertical impregnating machines the material again passes through an automatically temperature controlled pre-drying chamber, a temperature controlled resin bath and the several temperature controlled zones of the drying oven.

Polymerisation Under Pressure

The large multi-daylight hydraulic presses are equipped with a co-ordinated control panel, specially designed for this particular process and incorporating automatic control of pressure, temperature and time. From his control desk the operator remotely operates the control valve which causes the press to close and applies hydraulic pressure. This hydraulic pressure is automatically controlled at any pre-determined value according to the specific requirements of the particular type or grade of board being pressed. When the operator presses a start button on his control desk the instruments automatically turn on the heating medium and control the temperature rise of the press at a pre-determined rate.

When the cycle temperature has been reached it is maintained for the required length of time after which the heating medium is shut off and the cooling medium allowed to flow through the press. This condition is maintained for a pre-determined period until the board is sufficiently cooled, when the process is automatically stopped.

Automatic Controls

In spite of the number of operations performed and the number of valves to be operated, the sole responsibility on the operator for the performance of these functions is that of pressing the start button.

To permit stable conditions of the resin baths the heating medium is supplied from a special low temperature calorifier which in turn is automatically temperature controlled.

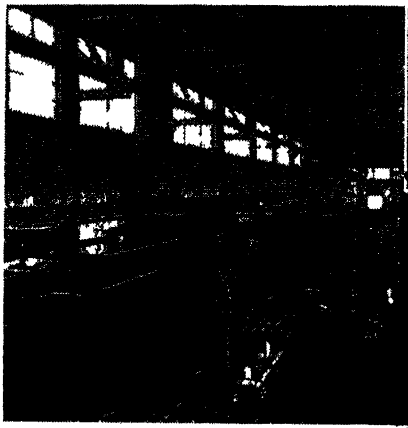
The large special resin still has another co-ordinated control panel designed for this particular process. The instruments automatically control the rate of temperature rise at the beginning of the reacting stage, automatic control of cooling in the case of excessive exothermic reaction, automatic change-over to any of several thermocouples to check uniformity of temperature of the charge, continuous recording of the various important temperatures and pressures.

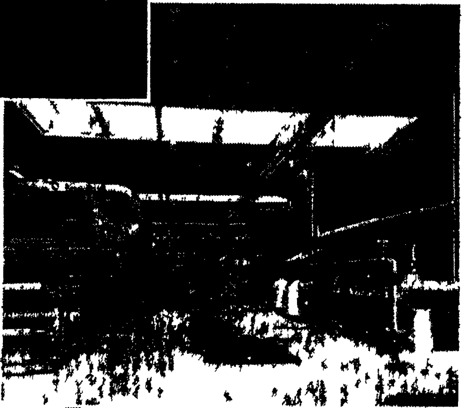
All the resin blenders are automatically temperature controlled by a heating or cooling medium to ensure the maintenance of the correct blending temperatures for particular resins. Similar equipment to rule out the possibility of inadvertent departure from the ideal temperature is, in fact, a feature of all the processing plant.

MODERN PLASTICS PRODUCTION

Right Installing at Cherton the 5,000 ton press, largest of its kind in the world

Below A view of the press gallery and, in the foreground, the new press for producing laminated plastics





PROCESSING AND INSPECTION

Above: Here paper and other materials are impregnated with synthetic resins under scrupulously controlled conditions

Left: The final stage of inspection of the completed lengths of insulating material

Prejudices Must Go

I.C.I. Chief's Plea for Collaboration

PRESENT on the occasion of the 10th anniversary dinner of Plant Protection, Ltd. (an I.C.I. subsidiary) in London last week were Lord McGowan, the I.C.I. chairman, Mr. Harold Wilson, President of the Board of Trade, Mr. W. J. Jordan, New Zealand High Commissioner, Mr. S. W. Cheveley, Plant Protection managing director, and others.

Chief speaker of the evening was Lord McGowan, who in proposing the toast "Export Trade" had no doubt fully considered the identities of the guests, their responsibiliies, and their problems.

The Facts

"It is for leaders of industry, in addition to what Cabinet Ministers may say," he asserted, "to get at the inner consciousness of their workers to tell them that our standard may be lowered if higher production is not forthcoming. I do not believe that the severity of the crisis is sufficiently appreciated by the majority of our people, and it must be brought home to them," he continued. "It can be done by bringing our workers more into our confidence and making them feel that they are part of an indivisible team. It may be slow, but that should not disturb us.

"The crisis we are now facing will give us opportunity of getting rid of ancient customs and prejudices; we should endeavour to integrate industry properly; above all, we must become more and more efficient."

Good Prospects

Referring to the effects of the war on countries previously concerned with the production of primary materials, Lord McGowan said that such countries had naturally turned to the development of secondary enterprise. He continued: "They may say, 'never again shall we be caught with our pants down.' This need not give us cause for undue anxiety. While there may be a temporary lessening of exports of certain kinds of goods from Britain there is much latent consumption power throughout the world justifying a higher and higher production.

"I am convinced that we have in British industry men of sufficient vision and drive to lead us into new and lucrative ventures."

A.B.C.M. Dinner Cancelled

In conformity with the Government's wishes, the annual dinner of the Association of British Chemical Manufacturers, due to be held on Thursday, October 9, 1947, has been cancelled.

Importance of Lithium

Expansion of Manufacture

WRITING in *The Scotsman* of October 2, Dr. James Lawrie draws attention to the growing importance of lithium to industry, and remarks upon the recent expansion in its manufacture and use.

Of importance in air-conditioning plants, and in the dehydration of food, is lithium chloride, which is claimed to have water-absorbing properties greater than any other known salt. In solution—it is stable at ordinary temperatures— it absorbs water, a number of vapours such as ammonia, and tobacco smoke, etc.

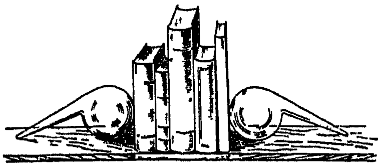
In foundry work, blast furnaces and cupolas give a greater production—often as much as 15 per cent—where lithium has been used for air conditioning the intake. According to Dr. Lawrie, fluoride of lithium, an insoluble and non-water absorbing material, may play a unique part in the composition of aluminium welding fluxes.

Lubricating greases possessing exceptional water-resisting properties have been obtained from lithium stearate soaps. Operating ranges for these greases are said to lie between −60° and 320°F. Yet another use for lithium stearate is in the simulation vegetable and mineral waxes. Some paraffins in admixture with lithium stearate form a gel which results in a wax possessing the properties of some of the expensive waxes. These may ultimately be used for the manufacture of cosmetics, crayons, polishing waxes, printing inks and insulators for electrical equipment.

Canadian Chemists Object

The Chemical Institute of Canada has raised strong objection to the ranking of professional chemists substantially below engineers of comparable training and experience in recommendations on salary scales by the Canadian Public Health Association. The Association's Committee on Salaries and Qualifications of Public Health Personnel produced the document earlier this year in aid of better remuneration and working conditions for public health officers.

The Institute has pointed out that "there is apparently a lack of appreciation of the capabilities and responsibillities of the professional chemist, as contrasted to the professional engineer"; and further that "This Institute sees no reason why a professional chemist should earn less than a professional engineer of comparable training, experience, and ability, and it views with very much concern any document which implies or suggests that such salary differentials should exist."



A CHEMIST'S BOOKSHELF

The Welding of Plastics. By G. Haim and H. P. Zade. London: Crosby Lockwood & Son, Ltd., 1947. pp. xi + 206. 21s.

The ever increasing literature on plastics is usefully enlarged by this book dealing exclusively with the welding of these materials. Although extensive studies of this subject have appeared in many publications, this recently developed process is now presented for the first time in a book which reviews progress from the beginning. The methods and equipment used for the welding of plastics resembles those for welding metals; the basic principles, however, are rather different. Here is a complete survey of the theory and practice of welding plastics, a field which the authors have followed since its development and which they have partly developed themselves. The book describes the whole subject in 17 chapters, beginning with the chemistry and physics of weldable plastics and their technology. The various welding processes, such as hot gas welding, high frequency welding, and other friction and flame weldings, etc., are described in separate chapters and other chapters are devoted to welding machinery, to industrial application and to the training of welders. Each chapter gives references to its text and also additional references on the respective subject. A glossary of terms used, quick tests for the identification of thermo-plastics, an index of trade names of commercial thermoplastics, a patent, name and subject, index and many tables, diagrams and 88 figures make the book a comprehensive and useful guide for technicians of all classes in this new field.

Elements of Physical Chemistry. By Samuel Glasstone. Third edition; pp. 695. 1947. D. Van Nostrand & Co., Inc., New York, and Macmillan & Co., Ltd., London, 25s.

This, as its name suggests, is a book for the student, but, so wide is its scope and so fundamental is its treatment that it should appeal equally well to those requiring a sound introduction to the principles of physical chemistry. Some, in fact, will see in this revised edition of the volume first published in March, 1946, a more useful aid for the latter class of reader than it is likely to be for the student chemist, whose need to-day to specialise this extremely far-reaching survey of subjects which normally require much more detailed treatment will not satisfy. Assuming, however, that the student is not deceived by the simplicity of the summary into which his own particular subject has been compressed, the remainder will serve as an extremely able review of other fields with which he may expect to come in contact later. Best of all, the information provided here is more than usually up to date and that clearly is, second to accuracy, the primary requirement of any study involving the nature of the atom and the laws of the behaviour of materials which proceed from it.

British Association Addresses

Sir Henry Dale's authoritative and well balanced study of the effects of wartime stimuli on science as a whole and of the peaceful applications of war-developed processes, the presidential address to the British Association for the Advancement of Science, introduces the volume in which the association has collected the addresses of the presidents of the various sections presented at the annual meeting of the association in Dundee in August and September. It costs 6s.

LETTER TO THE EDITOR

Sir,—The president of the Board of Trade recently informed industry that production for export must be given first priority in the supply of fuel, raw materials and labour.

There are many producers in the chemical and allied industries who have not hitherto explored the possibilities of an overseas market for their products, and consequently possess neither contacts with overseas buyers nor an experienced selling organisation.

May I suggest to those producers that the services which they require can be found among the established British merchant exporters, who, by their own enterprise and supported by specialised knowledge are endeavouring to re-establish the British trader in the markets of the world. The Chemical Traders' Export Group would gladly assist producers who are seeking the services of an export merchant.—Yours faithfully,

(Signed) F. G. W. Paige,
Secretary of the Chemical Traders' Export Group, 4 Lloyd's Avenue, London, E.C.3.

Home News Items

Advanced Rheology.—Commencing on Tuesday, October 28, a course of six lectures on advanced rheology will be given at The Polytechnic, Regent Street, by Dr. G. W. Scott Blair.

I.C.I. Portraits.—Portraits, paintings and drawings, which were commissioned by Imperial Chemical Industries, Ltd., for use in their advertising are at present being exhibited in the Kelvingrove Art Galleries, Glasgow.

Blaze at Reading Chemical Works.—The destruction of large quanties of chemicals was averted by the promptitude of the firemen when fire broke out last week at the Reading factory of Bradley and Bliss, Ltd., manufacturing chemists. Some ether exploded soon after the staff were evacuated and other explosions were narrowly averted.

More Wage Demands.—A minimum wage of £7 per week for underground workers, and £6 10s. per week for surface workers, representing in some cases an increase of as much as £2 per week is to be demanded by the National Union of Mineworkers. A special sub-committee has been set up by the union to draft the application.

Centenary of Chloroform.—The centenary of the discovery of chloroform by Sir James Simpson, will be celebrated in Edinburgh on Tuesday, November 4, when a scientific meeting to discuss the present use of chloroform will be held in the lecture room of the Surgery Department, University New Buildings, Teviot Place, Edinburgh. Papers will be read by Professor R. R. Macintosh, Dr. D. S. Middleton, and Dr. John Gillies.

Fire at Chemical Works.—A fire which broke out at the works of Silverwood Chemicals, Brixton, London, early on Tuesday morning last week destroyed valuable plant and equipment, and threatened adjoining dwellings. N.F.S. detachments from six London boroughs managed to control the outbreak, however, and local residents who had been ordered from their homes as a precautionary measure were later allowed to return.

U.N.O. Press Conference.—At a Press conference held in Russell Square House, W.C.1, last week, Mr. E. Wyndham-White, executive secretary of the Preparatory Committee of the United Nations Trade and Employment Conference, spoke on the conclusion of the I.T.O. talks in Geneva, and the forthcoming conference at Havana on November 21. He disclosed that of the 50 or 60 nations that had been invited, only Soviet Russia had intimated an intention not to attend.

Change of Name.—Messrs. Polish Trading Co., Ltd. (exporters of chemicals and metal products), advise that, with Board of Trade consent, the company's name has been changed to Copthall Trading Co., Ltd.

Coal Reserves.—Coal supplies for electricity undertakings in the north-west are now above the five weeks' average and should " see us through if we get a winter of even reasonable severity." Mr. George Gibson, chairman of the North-West Regional Board for Industry, made this statement in Manchester on September 22.

New Factories in Cheshire.—The production of alloys, paint, fatty oil processing and the reconditioning of steel drums are the objectives of four of the five factories projected at the Bromborough (Cheshire) industrial estate for which building licences are being sought. Work has also begun on a factory for Raymond Electric, Ltd.

A New Pit for Kent.—Kent, which is the nearest coalmining county to London, may have an addition to the existing collieries of Betteshanger, Tilmanstone and Chislet. The National Coal Board is believed to have under consideration a plan to sink a pit near Aylsham, in the Wingham-Addisham district.

Works Production Aid.—An exhibition at the British Enka Factory, Aintree, Liverpool, last week demonstrated to employees how their output of rayon is converted into products ranging from clothing and fabrics to motor tyres, to fulfil the Government demand that the rayon industry should increase exports by 390 per cent, nearly four times the pre-war rate.

Stove Enamel Tests.—The British Standards Institution has published a provisional British Standard for performance test for protective schemes embracing stoving paints used for the protection of light-gauge steel and wrought iron against corrosion, B.S.1391. A questionnaire will later be issued to those applying the test to determine whether it is suitable to be applied permanently.

Guest Keen Transfer.—In accordance with the plan for the modernisation of the tinplate and sheet industries in South Wales and the formation of the Steel Company of Wales, Ltd., Guest Keen Baldwins Iron and Steel Co., Ltd., have agreed to transfer the undertakings previously carried on by them at Port Talbot and Margam Works to the Steel Company of Wales, Ltd. The formal transfer of assets took place on September 27.

PERSONAL

Mr. J. H. Jolly has been elected chairman of Guest Keen & Nettlefolds in succession to Sir Samuel R. Beale, who has retired but who is to retain his seat on the board. Sir Samuel is to retain his chairmanship of Joseph Sankey & Sons.

Mr. B. B. Morton read a paper entitled "Metallurgical Methods for Combating Corrosion and Abrasion in the Petroleum Industry" at the Institute of Petroleum on Ocober 8.

Mr. Robert Foot, chairman of Powell Duffryn Technical Services, Ltd., left by air for Australia on Saturday last. He will discuss the further development of coal resources in the Dominion.

Mr. R. A. Plummer, chairman-designate of the Overseas Food Corporation, has recently left this country to undertake development work in connection with the Empire groundnuts scheme.

Powell Duffryn Chairman

Tributes to the work for the Welsh National Council of the Y.M.C.A. in the past 25 years by Mr. Edmund L. Hann, chairman of the Powell Duffryn Company, were paid at a luncheon at Cardiff last week at which presentations were made to Mr. Hann to commemorate his many gifts and services to the Union of Y.M.C.A. Boys' Club.

Dr. W. T. H. Williamson, Agricultural Director of the British Council since 1945, and at one time chief chemist to the Ministry of Agriculture in Egypt, has been appointed lecturer in charge of the newly-created department of soil science at Aberdeen University.

Mr. St. John Elstub has left the Ministry of Supply, Rockett Propulsion department, Westcot, Bucks., where he was deputy chief superintendent, to rejoin Imperial Chemical Industries, Ltd., as assistant chief engineer of the metals division.

Mr. A. T. Green, Director of Research of the British Refractories Research Association and the British Pottery Research Association, has been appointed hon. general secretary of the British Ceramic Society in succession to the late Dr. J. W. Mellor.

Mr. F. H. S. McDavid has resigned from the joint managing directorship of Brotherton & Co., Ltd., and from its board of directors. Mr. George Brearley has been appointed managing director, and Mr. George Brotherton-Ratcliffe has joined the board.

Obituary

Professor Max Planck, the famous German physicist, noted for his quantum theory, has died at Gottingen, aged 89.

OFFICERS OF IRISH CHEMICAL ASSOCIATION

At the recent annual general meeting of the Irish Chemical Association in Dublin, the following officers and Council were elected for the 1947-48 session: President—Prof. T. S. Wheeler; vice-president—Prof. E. J. Conway, F.R.S.; hon. sec.—Mr. G. F. O'Sullivan; hon. treas.—Mr. J. Belton; Council—Mr. V. C. Barry, Mr. T. W. Brendan, Mr. D. Crowley, Mr. B. G. Fagan, Miss M. MacNeill, Mr. D. V. Nowlan. and Mr. D. O'Tuama.

German Patent Law

The Chamber of Technic in Berlin has just published the drafts of a new German "Patent Law" and a "Law for Furtherance of Inventiveness," both of which are to form the basis for pending negotiations at the Chamber.

It is suggested that two different categories of patent rights should be created, the first to conform to the old German patent law, and the second to safeguard the interests of the "little man," who will receive an "Inventor's Certificate." He will not have to pay annual fees, and the certificate, it is suggested, should be granted only to the inventor personally. In such cases, the Patent Office reserves the right to utilise the invention, which it may test in its own laboratories at its own expense. The patent Office may ultimately grant licences for the utilisation of such an invention on the understanding that the inventor reaps the benefit.

In the event of a patented invention not being utilised within three years, invitations may be extended to third parties to apply for utilisation licences.

It is understood that no existing German patent will lose its validity under the new law, which has yet to be considered by the Allied Control Council. A Military Government spokesman for the North Rhine-Westphalia district, who recently urged German firms not to make known new ideas because patent rights are not as yet protected, has predicted that the new patent law might be accepted before the end of 1948.

Better Coal Total.—Coal production in the week ended September 27 represented a small increase, notwithstanding a small reduction in output of deep mined coal. The overall total was 3,901,800 tons, comparing with 3,896,300 in the previous week and 3,788,100 in the corresponding week last year.

Overseas News Items

Uranium and Thorium in N.Z.—Uranium and thorium is to be separated from gold dredge trailings and sands in New Zealand.

Asbestos Project in Australia.—Wittenoom Gorge, situated in the Hammersley Ranges of Western Australia, is reported to be the scene of extensive mining operations for blue asbestos.

U.S. Copper Production.—Production from the Ergeni mine, at present the only Turkish copper producing mine, is reported to have totalled 10,050 tons of blister copper last year. The entire output for the current year is already stated to have been allocated.

World Tin Allocations.—Additional allocations of 553 tons of tin metal for the second half of 1947 have been granted by the combined Tin Committee to Australia (150 tons), New Zealand (129 tons), Ceylon, Egypt, Finland, Ireland, Palestine and Jugoslavia.

Fiat to Make Resins.—The Italian Fiat Company is building a large pilot plant for the manufacture of synthetic resins at Porto Marghera. The technique of this branch of industrial chemistry has been completely revolutionised in Italy during the war.

Copper Ore in Czechoslovakia.—Geologists are of the opinion that some Slovakian deposits contain considerable quantities of copper ore, soderite and silver. A refinery is to be set up for the testing of the various seams of the mineral deposits near the town of Banska Bystrica.

Stainless Steel Paint.—Stainless steel powder mixed with paint, spar varnish and lacquer, increasing the life-time of a painted surface by as much as 300 per cent, is finding rapid industrial and domestic acceptance in the United States. The new material is furnished to customers in paste form which, when mixed with lacquer, varnish, or any other so-called paint "vehicle," will render a surface highly resistant to corrosion by chemicals. The material, available commercially, will soon be sold also in the form of flakes.

New U.S. Standards Bureau.—An independent agency for sampling, testing, and certifying materials and products to aid consumers, distributors and producers has been organised in New York under the title of American Standards Testing Bureau, Inc. with an address at 44 Trinity Place, New York City. It is a fact-finding organisation concerning itself with standards and standardisation, and is staffed with specialists in methods of preparing, sampling and testing the application of specifications, and developing test procedures.

Pakistan Industrial Projects.—According to a spokesman of the Dominion of Pakistan, a large-scale prospecting programme for petroleum, coal and iron-ore deposits is soon to be carried out.

Aluminium Industry for N.Z.—A representative of Aluminium, Ltd., of Canada, recently arrived in New Zealand to investigate the possibilities for the establishment of an aluminium industry.

U.S.A. to Tax Scrap Imports.—The U.S.A. is re-imposing, as from July next year, the collection of duties on imports of scrap iron, scrap steel and non-ferrous metal scrap. Collection of these duties was suspended during the war.

More Italian Mercury.—By the reconstruction of the works at Monte Amiata, Italy, now at an advanced stage, it is hoped to turn out 2500 tons of mercury annually. Present local consumption does not exceed 100 tons, and a considerable margin should be available for export.

Metal-Distinguishing Device.—According to a recent report from the U.S.A., a leading concern there has developed an electronic device which is said to be capable of differentiating, not only between one metal and another, but also between various grades of the same metal.

U.S.S.R. to have Large Gas Liquefaction Plant.—Dresser Industries, Cleveland, Ohio, is reported to have signed a contract with the Soviet Government for the erection of a gas liquefaction plant south of the Russian capital. Daily capacity will be 4 mil. cu. ft. of natural gas, while there will be storage facilities for 1,620,000,000 cu. ft.

Coal Deposits Discovered in the Tyrol.—Occurrences of good quality coal are reported to have been found, as the result of geophysical investigations, in the Keesen-Walchsee area of the Tyrol. Reserves are estimated at about 20,000,000 metric tons. Preparations for their exploitation are in progress and it is hoped to mine 600 tons per day in three shifts.

German Glassware for India.—According to a recent announcement in *The Indian Trade Journal*, a technical glassware-manufacturing firm in the Russian zone of Germany is preparing to export various types of laboratory and similar equipment to India. The list includes tubes, flasks, gas regulators, gas-washing bottles, syphons, stopcocks, taps, condensers, funnels, thermometers, pumps, hydraulic presses, water hammers, weighing bottles, and various kinds of graduated measuring instruments.

Company News

The nominal capital of **British Xylonite Company, Ltd.,** Hale End, London, E.4, has been increased beyond the registered capital of £700,000, by £300,000, in £1 ordinary shares. 300,000 ordinary shares have been converted into stock.

Erinoid, Ltd., manufacturers of substitute material for ivory, bone, and tortoiseshell, has announced a trading profit of £180,400, an increase of £47,000 over last year. Stockholders are to receive a distribution of 20 per cent, including a 5 per cent cash bonus.

P. B. Cow and Co., rubber and plastic manufacturers, has declared an interim dividend on the £410,000 ordinary stock of 12½ per cent on account of 1947. This is in accordance with the directors' statement in the recent offer for sale of 250,000 4s. units.

Lancegave Safety Glass (1934), a subsidiary of Triplex Safety Glass Company, is paying a dividend of 10 per cent, less tax, for the 15 months ended June 30, 1947. This is the first payment since the 10 per cent distribution for the year to March 31, 1938. Net profit for the 15 month period was £15,471, compared with £11,761 for the previous 12 months.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HARYDE PRODUCTS, LTD., Newcastle-on-Tyne, manufacturing chemists. (M., 27/9/47.) August 15, £1000 debenture to V. C. Booth, Brierley Hill; general charge. *Nil. December 31, 1945.

FINE DYESTUFFS & CHEMICALS, LTD., Manchester. (M., 27/9/47.) August 14, £12,000 mortgage to A. B. Fleming & Co., Ltd.; charged on land with warehouse thereon at Manchester.

TOWER LABORATORIES, LTD., London, W.C. (M., 27/9/47.) August 11, letters of authorities, securing £1850 to J. Florsheim & Co., Ltd.; charged on certain book debts. *—. December 31, 1946.

BAKER RESEARCH LABORATORIES, LTD., London, S.E. (M., 11/10/47.) September 3, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on 9 St. Mary Street, Canning Town.

MODY & CO., LTD., Manchester, manufacturing chemists. (M., 11/10/47.) September 1, charge, to Barclays Bank, Ltd., securing all moneys due or to become due to the bank; charged on land and buildings known as Ulster Factory, Long Lane, Orford, near Warrington. *Nil. December 31, 1945.

Satisfactions

LANGLEY ALLOYS, LTD. (Bucks). (M.S., 11/10/47.) Satisfaction August 28, of mortgage registered November 18, 1942.

VINYL PRODUCTS, LTD., Carshalton, chemical manufacturers. (M.S., 11/10/47.) Satisfaction September 1, of charge registered December 19, 1945.

TYNE CHEMICAL CO., LTD., South Shields. (M.S., 27/9/47.) Satisfaction August 11, of charge registered July 26, 1945.

Chemical and Allied Stocks and Shares

SIR STAFFORD CRIPPS' reference to the possibility of further "cuts" in imports affected sentiment in stock markets where business remained on very moderate lines. Nevertheless, there was again little selling and, despite continued talk of another Budget next month with some new form of E.P.T., industrial shares were generally well maintained. On the other hand, British Funds were more active, but lower, the national savings figures being disappointing.

Chemical and kindred shares were generally quite well maintained, although Imperial Chemical at 47s. 3d. lost a small part of an earlier advance. Monsanto Chemical 5s. shares at 57s. moved higher on balance, buyers coming in owing to current dividend estimates. Greeff-Chemicals Holdings 5s. shares were 15s. 6d. Fisons have been active around 66s. 6d., W. J. Bush remained firmly held and quoted at 90s. with B. Laporte 78s. 9d. Elsewhere, Major & Co.'s 2s. shares were 4s. There was again a good deal of activity in Distillers in anticipation of the share splitting; the £1 units rose further to 142s. Turner & Newall have been steady at 72s. 6d., United Molasses strengthened to 49s. and Wall Paper Manufacturers' deferred to 43s. 9d. in response to hopes of an increase in the forthcoming dividend.

Borax Consolidated were 54s. 4½d. with British Oxygen 94s. 4½d., while British Aluminium firmed up to 45s. 9d. Triplex Glass 10s. ordinary at 32s. 9d. lost part of the good rise which followed the improved results and higher 10 per cent dividend. Colliery shares, such as Horden and Bolsover, were favoured, the assumption being that in many instances current market prices are moderate in relation to the eventual compensation payments. Paint shares were good in response to prospects of export trade expansion which, it is said, will be helped by the substitutes for linseed oil. Pinchin Johnson improved to 60s., International Paint were £6¾, Goodlass Wall 38s. 3d. and Sherwoods Paints 26s. 10½d.

Iron and steels were favoured in view of the good yields, the assumption being that dividends should be well maintained and that nationalisation may be deferred indefinitely. Dorman Long preferred were good at 45s., Neepsend strengthened to 33s. 9d., in anticipation of the dividend, John Summers rose to 29s. 9d. following the interim payment, while, in response to the higher profits and maintained 8 per cent dividend, United Steel improved to 26s. 10½d. Following the higher payment, Imperial Smelting have strengthened to 21s. Amalgamated Metal were 16s. 9d., but, elsewhere, Dunlop Rubber eased slightly to 72s. General Refractories have been steady at 21s. Murex improved to 86s. 3d.

Textiles became less active, although, generally, recent gains were well held, Bradford Dyers being 22s. 7½d., Calico Printers 21s. 7½d. and Bleachers 10s. 10½d. The building group eased with Associated Cement 63s. 3d. and British Plaster Board 25s. 3d. In other direction, Griffiths Hughes rallied to 43s. 9d., Beechams deferred were steadier at 24s. 9d. with Sangers 30s. 3d. and Timothy Whites 44s. Glaxo Laboratories rallied and, although best levels were not held, were higher on balance at £20¾. British Drug Houses 5s. ordinary have changed hands around 12s. 3d. Oil shares were affected by latest international news, Burmah Oil coming back sharply to 71s. 3d. with Shell 82s. 6d. and Anglo-Iranian £8 5/16. Later, however, there was a good rally, Anglo-Iranian rebounding to £8 9/16.

British Chemical Prices

Market Reports

NO changes of any importance have taken place in the past week and values generally are firmly held at recent levels. The overall supply position has shown no marked improvement, and spot transactions are difficult, and for many products impossible, to negotiate. Any increase in production is expected to be taken care of by the expanding home consumption and the export demand, and, therefore, we must be prepared to see a continuation of the present tight conditions for a considerable time. The demand for acetic acid is in excess of available supply and oxalic, tartaric and citric acids are in good request. Barium chloride is reported to be in active demand. A steady business is being done in formaldehyde and most of the wood distillates are enjoying a good inquiry. Lead oxide remains in strong request and this also applies to zinc carbonate and the copper compounds, for which there is also a good overseas inquiry. Among the soda products, the chief feature is the continued scarcity of soda ash. Chlorate and bichromate of soda are also firm and scarce. The potash products do not call for comment, with the exception of permanganate of potash, the demand in this section being greater than the supply. A persistent demand is reported from the tar products market, with an increasing export inquiry for cresylic acid and pitch. Naphthalene offers are restricted, but a fair amount of business is being done in solvent and heavy naphthas, xylols and toluols.

MANCHESTER.—A steady home and export inquiry for a wide range of heavy chemical products has been reported on the Manchester market during the past week. Textile and other industrial consumers on the domestic market have been clamouring for deliveries against orders already placed, and there is pressure from shippers also for the completion of outstanding business. The soda, potash, and ammonia compounds are all meeting with a brisk demand. The firmness of prices continues in virtually all sections, and in a number of lines a stiffening has occurred to cover higher railway charges. A steady trade has again been reported in most of the by-products.

GLASGOW.—Busy conditions have been experienced in the Scottish chemical market during the past week. There has been a heavy demand for formaldehyde, Glauber salts, trisodium phosphate and Epsom salts, but the supply position of these materials shows no sign of improvement. There was a good deal of unaccustomed activity over the whole range of chemicals in reasonable supply, as buyers were endeavouring to obtain supplies before the increased rail rates affected prices. The upward trend in prices resulting from the increased cost of bags, etc., continues. Activity by re-packers making soap substitute continues unabated resulting in heavy demand for synthetic detergents. Demand for sodium metasilicate is also heavy and the supply position is not likely to improve for some considerable time. In the export market, conditions have been a little quieter, but there is a noteworthy interest in chemicals used in the manufacture of war explosives for Greece. Some orders have again been booked.

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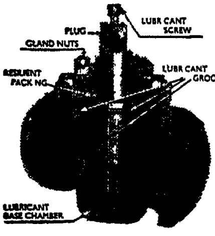

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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Preparations containing alkali sulphides —Ciba, Ltd. Feb. 19, 1946. (Cognate application 4661/1947.) 4660/1947.

Ferrous alloy.—Coast Metals, Inc. Feb. 9, 1945. 20836/1947.

Manufacture of varnish resin interpolymers.—Dow Chemical Co. Feb. 23, 1946 4561/1947.

Methods of making organo siloxanes.—Dow Corning Corporation. Feb. 26, 1942. 20122/1947.

Process of preparing new antimalarial compounds and the compounds resulting therefrom. N. L. Drake, and J. O. van Hook. Feb. 19, 1946. 4726/1947.

Explosive compositions.—E.I. Du Pont de Nemours & Co. (Jan. 14, 1944.) 15308/1945.

Manufacture of a new azo pigment —E.I. Du Pont de Nemours & Co. Feb. 19, 1946 4696/1947.

Process for the production of nitriles.—E.I. Du Pont de Nemours & Co. Feb. 21, 1946. 5088/1947.

Production of hydrocarbon substituted silicon halides.—E.I. Du Pont de Nemours & Co. Feb. 21, 1946. 5089/1947.

Vinyl polymers.—B. F. Goodrich Co. Feb. 23, 1946. 4808/1947.

Vinyl polymers and method of producing same.—B. F. Goodrich Co. Jan. 25, 1940. 19604/1947.

Rubberlike multipolymers containing a conjugated diene hydrocarbon. B. F. Goodrich Co. March 5, 1940. 19605/1947.

Plasticised vinyl polymers and process of plasticising same.—B. F. Goodrich Co. March 1, 1941. 19606/1947.

Polymerisation of butadiene-1, 3 hydrocarbons.—B. F. Goodrich Co. April 4, 1944. 20776/1947.

Vinyl polymers and method of producing same.—B. F. Goodrich & Co. Jan. 27, 1941. 20969/1947.

Vinyl polymers and process of producing same.—B. F. Goodrich Co. Oct. 16, 1940. 20970/1947.

Preparation of ethers of cashew nut shell liquid, etc.—Harvel Corporation. August 24, 1939. 20214/1947.

Acrolein anacardic material reaction products.—Harvel Corporation. August 30, 1944. 20215/1947.

Preparation of cashew nut shell liquid.—Harvel Corporation. Sept. 17, 1945. 20216/1947.

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Head Office :
"Kern House" 36/38, Kingsway,
LONDON, W.C.2

Branch Office :
51, South King Street,
MANCHESTER 2.

Telephone:
Holborn 2532-3-4-5
Blackfriars 0083/84

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Refrigeration

REFRIGERATION is not included among the eighteen unit operations of chemical engineering but it is a vital factor in many chemical processes in which the removal of heat is necessary and particularly where a substance must be cooled below atmospheric temperature. The manufacture of azo dyes, the separation of an easily freezing product from liquid isomers, and the food and beverage industry are examples of industrial processes in which refrigeration is required. It is still a never-failing source of wonder to many of those who do not understand the ways of science that a gas flame can be used to produce cold. So important has the practice of refrigeration become that the manufacture of refrigerating plant and its operation now ranks as an independent industry, which, nevertheless, must always remain closely allied to the chemical industry.

Some indication of the importance attached to refrigeration may be obtained from the fact that research work affecting the refrigeration industry is in progress at three stations of the D.S.I.R. at Cambridge, Ditton, and Torry, and also at the National Physical Laboratory. The new Mechanical Engineering Research Board is, among other subjects, to undertake work on heat transfer and applied thermodynamics. Work on very low temperatures is being done under Professor Newitt at Imperial College in addition to what is being done in the laboratories of industrial firms. There also exists a low temperature group of the Physical Society specialising in this subject. In addition there is of course a very large volume of work done overseas as for instance in the U.S.A. where there is a Refrigeration Research Foundation. It is hardly surprising, therefore, to find that in order to bring the results of all this work before the industry concerned the Institute of Refrigeration was formed. We were privileged to attend the presidential address delivered to this body on September 23 by Mr. W. S. Douglas. It was perhaps noteworthy of the trend of thought in many industries that the basis of his address should be the need for technical education of refrigeration engineers and for training new entrants into the industry.

The change which has come about on the technical side of the industry within a comparatively few years is striking. Before the first World War there was of course a certain amount of refrigeration but the plant was very crude by modern standards. Compressors, as Mr. Douglas reminded us, were nearly all of the open type, the larger ones horizontal, doubt-acting, and running at speeds of the order of 100 r.p.m. The whole plant was bulky and cumbersome, with few refinements and operating at what to-day would be considered as low efficiency. It was regulated by hand. There were no high-speed machines, no automatic plants, no flooded working or float control, no pump circulation of the refrigerant in the evaporator, and no dry compression. There were no shell and tube evaporators or condensers, no turbo-compressors, booster-compressors, or two-stage absorption machines; there were indeed comparatively few two-stage machines of any type. The whole vast field of domestic refrigeration and small commercial units, now reduced to a fine point of standardisation, simply did not exist. Quick freezing or gas storage,

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now well established applications of refrigeration, were unknown. Air conditioning was only in its early and primitive stages, and the heat pump no more than an interesting suggestion made by Lord Kelvin. " Plants for the liquefaction of air were in full commercial operation, but low temperature refrigeration in the range of –40° to –120°F. and the development of two-stage, three-stage and cascade machines which has accompanied it, was practically unknown. There was no penicillin to make, no wind tunnels or stratosphere chambers to cool, and the great developments in the chemical and petroleum industry were still mainly to come."

It is now fairly common knowledge that refrigerating plant has been brought to a high state of efficiency by the developments which, as Mr. Douglas indicated, were unknown in 1914. He ascribes the improvements that have been made partly to the violent stimulus of war, but even more to the pioneer work, such as the researches leading to gas storage and quick freezing, in which we lead the world. Apart from its use in normal industry, refrigeration now plays a highly important part in world economy in bringing perishable foods from far-off countries which produce them to those manufacturing populations that must be fed on imported foods. Refrigeration, in fact, is opening up the tropical countries where many of the fruits of the earth grow in their greatest profusion and is enabling some countries to specialise in agriculture while others specialise in industrial manufacture. It is obviously destined to play a very important part in the economics of the world and possibly in its political development.

Mr. Douglas foresees that " so long as no better way of preserving food is invented, refrigerating machines and cold stores will be wanted, and new and better ways of applying them will doubtless be discovered. The great chemical and petroleum industries will surely make increasing and perhaps novel demands upon refrigeration; and with an industrial world more refrigeration-conscious than it was, it seems probable that new applications of the type of age-hardening, shrink fits, low-temperature testing of instruments, and so forth will confront us. Further demands for industrial air conditioning plant are also likely to arise. Air conditioning for comfort purposes too, will doubtless require more attention, particularly with the expansion of export for hot countries. There seems likely indeed to be increasing progress, both at the lower and higher end of the temperature range within which we work, each with its own problems and its own technique. Growth in scientific knowledge and its application has become increasingly rapid and it seems difficult to avoid the conclusion that the art of refrigeration will become more and more advanced and will demand from those practising it an increasingly high standard of technical knowledge and accomplishment."

It is against this background that Mr. Douglas emphasised the necessity of promoting specialised education in refrigeration. A good deal has been done in conjunction with the City and Guilds of London Institute and certain more advanced courses are in operation. We were interested in Mr. Douglas's reference to a post-graduate course in refrigeration which it is hoped will be instituted at the new National College for Heating and Ventilating, Refrigeration and Fan Engineering, which the Ministry of Education hopes to start in the autumn of 1948 in a wing of the Borough Polytechnic. As an ancillary to many industries, including the chemical industry, it is very important that the art and science of refrigeration should become firmly established on a scientific and technological basis, and we have no doubt that the Institute of Refrigeration will continue to extend the good work which it has begun.

NOTES AND COMMENTS

The Bulldog Spirit

IN striking contrast to the obscurities and contradictions which have infested recent Government policy in industrial and economic affairs, the current 31st report of the Association of British Chemical Manufacturers and the able summary by Mr. L. P. O'Brien on relinquishing his office as the year's chairman provide reassuring evidence that consistent endeavour and concentration upon essentials have not been wholly overlaid in this country by visionary planning without performance. Without such tokens of this industry's ability to stick tenaciously to the job in hand our prospects in the months immediately ahead would seem grim indeed. The association has clearly needed all the tenacity it can muster in its rôle as spokesman for the chemical industry in national affairs. Many of the subjects with which the A.B.C.M. was engrossed last year figure again in this year's summary and the history of such contemporary problems as regulating the level of Germany's post-war chemical production illustrates vividly the need for perseverance which the A.B.C.M. commands in full measure, unlike some architects of Government policy.

Changing Policy

THE prospect that British chemists will not again have to contend with the fierce, integrated competition of German manufacturers of fine chemicals and dyes, which seemed a certainty less than two years ago, is now by no means assured. The fusion of the British and American occupied zones, introducing the differing perspective of American economy and, above all, the urgent need to establish a German export industry have conspired to render fruitless much of the expert advice and study which the A.B.C.M. has already provided at the request of the authorities. Mr. O'Brien, in his valedictory review, drew a clear picture of the setbacks and frustration which have characterised part of the work his association has done in this connection. Equally clearly, it is good to note, the A.B.C.M. is in no mood to let the matter drop. In its determined campaign to safeguard home interests in the framing of a policy for Germany and in the allocation of supplies the association deserves unreserved support.

Co-ordination Needed

A CURIOUS instance of that lack of co-operation between government departments which, in our opinion, is one of the strongest arguments against any form of State control came to our notice this week. Apparently a manufacturer in the North of England who had erected an aluminium spinning plant was visited by a Ministry of Labour official who congratulated him on setting up a new industry in that particular area and absorbing people who would otherwise be unemployed, and putting them to produce a material which was a valuable export. So pleased, in fact, was the official that he urged the manufacturer to increase the plant capacity by 50 per cent. The manufacturer agreed and he and the official went into a huddle regarding the factory extensions necessary to cope with this 50 per cent increase. That same afternoon, however, a Ministry of Fuel official also visited the factory. But he, far from urging any increase in production, told the manufacturer he was using too much fuel and he would have to reduce his power consumption by 50 per cent. It was pointed out to the official that this would mean a 50 per cent reduction in the amount of work the factory was doing. The official agreed that this would be so, and suggested shutting down half the factory. The poor manufacturer, cast for the unpleasant rôle of tug-of-war rope in this "pull Devil, pull baker" episode, is now resolved to do nothing at all until the respective departments have settled on a common policy. This single instance of inter-departmental conflict—which must surely be multiplied many times in different parts of the country—must give rise to apprehension that the relative importance of fuel/labour/exports has not even yet been worked out.

Paper and Knowledge

IT must be surprising to many British chemists and technicians to see American journals complaining about a paper shortage and delay in publication of scientific papers. But this problem, and that of production facilities are discussed in two recent issues of leading American chemical journals. In *Industrial and Engineering Chemistry* a leader-writer, discussing the length of time between the reading of a paper and subsequent publication, says: "One can easily become very pessimistic concerning the outlook for scientific literature during the next decade. Even in the United States, we are woefully short of paper and production facilities. At this moment, most scientific publications face discouraging delays in publishing current scientific developments. Add to these factors rapidly mounting costs and the fact that the international political outlook is uncertain, to say the least, and the picture is a most discouraging one." The writer agrees that in other countries the position is much worse than it is in the U.S.A., but adds, "A limited world capacity for publication is perhaps the greatest barrier to the rapid strides in science in the near future. What, if anything, can be done to meet this situation in this country and the even more desperate one which hangs like an ominous black cloud over scientific Europe at the present time?"

Man-Made Barriers

CONTINUING, the writer declares: "Scentists cannot continue indefinitely to operate successfully in a partial vacuum. Our success in restoring the normal, healthy, international exchange of scientific knowledge is now limited by such prosaic but tangible restrictions as paper supplies, printing facilities, artificial currency exchange barriers, and an unfavourable international political outlook." In the *Chemical and Engineering News* it is the queston of costs which is uppermost in the mind of the leader-writer and the effect on scientific and editorial freedom if government subsidies have to be accepted to help publication. In the development of his argument the writer makes a statement which, coming from an outsider, should cause us to think. He says: "Already in Great Britain scientific publications are being dictated to by government," and finally goes on to ask if the Americans can escape a similar fate.

The Other Black Market

THE general Press is not as a rule a very fruitful source of reliable information on chemical and allied affairs, but even the lighter sections of the London *Evening Standard* found room last week for one of the piquant and peculiar situations in which industrialists are frequently involved in dealing with the Government supply departments. The subject in this instance is tung oil, which, freed from Government control of buying arrangements, became available in ample quantities at around £184 per ton. The price while all purchases had to be made by licence was £250. One London paint and varnish manufacturer, relates the *Evening Standard*, received with joy from a Government selling agency the glad tidings that "You are free to purchase whatever quantity (of tung oil) you require," but received a shock when he reached the next paragraph: "The only restriction is that half of your requirements have to be covered from Board of Trade stocks at £250 a ton." "That," comments the *Evening Standard*, "illustrates very prettily what Government bulk buying really means." The facts are, unfortunately, as stated by the evening paper—except possibly to a departmental minded person, one of whom was at some pains this week to point out to this journal that the regulation stipulates not "one-half of your requirements" but that an amount equal to the independent purchase must be drawn from the Government stock. That, no doubt, is one of the fine distinctions which only a mind educated in Government gnat-straining procedure can appreciate.

QUALIFICATIONS FOR CHEMICAL WORKERS

A WELCOME addition to plans already published for widened facilities for chemical workers to acquire recognised qualifications is the scheme in course of preparation by the Royal Institute of Chemistry Committee on Education and Training of Technicians. This committee is representative of many bodies in addition to the R.I.C.

The project is revealed in the summary issued this week of recent work by the committee on this subject. The committee notes that: "For the education and training of assistants in industrial control laboratories and of technicians engaged in plant operation, some provision is already made by courses leading to national certificates in such subjects as chemistry, applied physics, and engineering and to certificates of the City and Guilds of London Institute in various branches of technology, and those who have the necessary keenness and ability can proceed to a professional qualification in a particular science or to an external degree."

The attention of the committee has, therefore, been directed essentially to that important class of technicians, which includes laboratory stewards and, at the highest level, laboratory superintendents, whose work is vital to the maintenance and operation of research laboratories in industrial organisations, research associations and academic institutions and of laboratories for the instruction of students in universities, technical colleges and schools.

First-Class Technicians

Their work is very varied and involves experience of techniques derived from a number of branches of science and technology; most of them are to be regarded not as potential chemists, physicists, biologists, etc., but as potential first-class laboratory technicians. So far, however, few courses have been provided for the training of technicians of this type, nor is there any qualification in their own field to which they may aspire.

To remedy this position the committee is engaged in preparing syllabuses for the certificate and diploma stages of a general course of training for such laboratory technicians, based on proposals put forward by a sub-committee consisting of the laboratory technician members of the committee. The drafts of the certificate course are nearing completion and will then be circulated for comment to bodies represented on the committee and to other organisations likely to be interested. It is hoped that progress may be sufficiently rapid to enable a trial course to be started early in 1948.

In the meantime, it is understood that a representative group of laboratory technicians who have been associated with the work of the committee are taking steps to constitute a professional qualifying body similar in many respects to the Institute of Medical Laboratory Technology.

POWELL DUFFRYN PLASTICS

Research at Battersea

AN interesting indication of the direction in which future research work by Powell Duffryn, Ltd., is likely to develop has been given by the chairman of the company, Mr. Edmund L. Hann, in his annual statement to shareholders. Much of the company's elaborate research organisation has now come under control of the National Coal Board, but among the branches of which the company retains control is the research and development of plastics in which it was formerly associated with De La Rue Plastics.

Powell Duffryn is now sole owner of the plastics research organisation, Delanium, Ltd., and at the recently-acquired Battersea works has made important progress in producing from coal material for the plastics industry. An incidental achievement in the course of this research was a new means of producing carbon of high quality.

The research laboratories at Battersea, states Mr. Hann, are continuing to be used for further research and development work in connection with carbon products, but are being widened in scope and adapted for use as a research organisation capable of conducting original research in a wider field, and of testing results on a semi-commercial scale on behalf of the Powell Duffryn group as a whole. The name of the research organisation has accordingly been changed to Powell Duffryn Research Laboratories, Ltd.

Fuel Saving in Scotland

BECAUSE the average chemical plant is largely concerned with continuous processes, the response by West of Scotland chemical manufacturers to the Government's request for staggered working hours differed from that of most other industries—writes our Scottish correspondent. This makes any system of "staggering" extremely difficult, and as far as can be ascertained, relatively few of such plants have been able to devise any method whereby "staggering" can be directly applied. Such firms have adopted the alternative of reorganising and adjusting productive work internally so that as much as possible is diverted from the peak load periods. Where possible, chemical manufacturers have rearranged their working hours as well as making such internal adjustments.

Scottish Oil and Chemicals

£12 Million Development Likely

THE Anglo-Iranian Oil Co., Ltd., might have fostered substantial development of the Scottish shale oil industry had such development not demanded "an application of the human element which made it almost impossible to develop the industry in terms of operation acceptable to the workers." This was part of the information imparted by the Anglo-Iranian chairman, Sir William Fraser, as a guest recently at a luncheon for former pupils of the Royal Technical College, Glasgow. He said that if the Distillers' Company's projected plant for producing chemicals from petroleum, should be at Grangemouth, as he hoped it would be, that and the Anglo-Iranian plant for increased refining of imported oil would represent a £12 million development for the area. Oil reserves in the Western Hemisphere and the Middle East were about equal, Sir William said, and he thought oil supplies would last as long as man needed them. Oil might become more difficult to find, but it would be available until man could do without it. He pointed to the need, on the part of businessmen, to avoid hesitation because of political uncertainty.

"Mighty Effort" Needed

Lord M'Gowan, chairman of Imperial Chemical Industries, Ltd., unveiling a bronze plaque near Dalry, Ayrshire, commemorating the completion of the Knockendon Reservoir, which will provide daily an additional 2¼ million gallons of water for Irvine and district, criticised the Government's recent handling of economic affairs. "It is a tragedy," he said, "that two years after the fighting finished we in this country should be entering an era of even greater austerity than we endured during the war. Cuts in food, inability to replenish their households, and many kinds of shortages may induce in people a feeling that will distract them from a higher productive effort."

The direction of industry was a most serious problem, with implications that we could not foresee at the moment.

"I believe," he continued, "that if we grasp the opportunities now before us and profit by our mistakes in the past, we shall come out, in time, stronger than ever, but this will take a mighty effort.

Import Duties Exemptions

The Treasury has made the Import Duties (Exemptions) (No. 3) Order, 1947, which exempts from general *ad valorem* duty sponge iron, cobalt metal and bismuth alloys. The order (S. R. & O., 1947, No. 2075) took effect on October 3.

Oil and Colour Chemists

List of Officers

OWING to the inadvertent publication (elsewhere) of an incomplete list of officers and committee of the association's Bristol Section, an official, complete list has now been received. It reads as follows: Chairman, Mr. V. C. Thompson; vice chairman, Mr. R. C. Crane; hon. secretary, Mr. C. G. Phillimore; hon. publications sec., Mr. R. M. Irving; hon. treasurer, Mr. R. C. Crane; hon. auditor, Mr. N. C. H. Bodman; research and development officer, Mr. H. K. Turnbull. Committee: Dr. E. Marsden, Mr. G. F. Paget, Mr. C. Pearce, Mr. R. R. Stephens, Mr. W. G. Wade, Mr. W. J. McWaters.

MORE COAL FOR INDUSTRY

MR. Hugh Gaitskell, the Minister of Fuel, on Tuesday announced the scale of allocations of coal for the winter months, indicating that an endeavour is to be made to provide more substantial supplies to industry and to economise further on domestic consumption. In the six months November 1 to May 1, 1948, 24,250,000 tons are to be allocated to industry, 23 per cent more than was consumed last winter. Special provision is to be made to ensure more adequate supplies of fuel for steel production, which is to have some 25 per cent more coke than it received last year. The Minister estimated that the total coal output for the year would be in the region of 197 million tons.

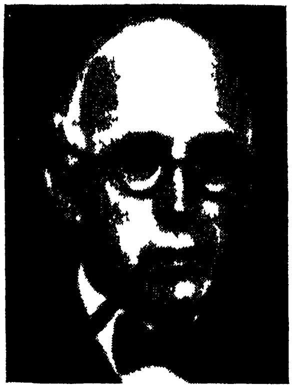
Petsamo Compensation Agreement

The Governments of Canada and Soviet Russia have come to an agreement whereby the latter will be allowed a further period of 15 months in which to complete payment of the 20 million dollars which Canada is to receive as compensation for the expropriated nickel mines at Petsamo. Payments to date amount to 8 million dollars, and the balance will now be paid in ten equal payments to be completed by December 31, 1951.

Phytosterol.—Of interest to manufacturers of synthetic hormones, ointments, emulsions, etc., is a recent announcement by Messrs. Croda, Ltd., manufacturers and suppliers of chemicals and chemical products. This firm is now offering commercial quantities of Phytosterol (Swedish origin) produced from tall oil.

Association of British Chemical Manufacturers

Chairman's Speech



Sir Harry Jephcott, the new Chairman

A COMPREHENSIVE summary of the principal events and influences which have helped to shape the course of the chemical industry in 1947 was provided by the speech of the retiring chairman, Mr. L. P. O'Brien, at the 31st annual meeting of the Association of British Chemical Manufacturers in London on October 9, and the association's annual report.

The chairman, moving the adoption of the report and accounts, which was approved, referred with satisfaction to the establishment of the association's first overseas branch office in Bombay, which would provide British chemical manufacturers with an organisation through which they could act in unison. He predicted: "Despite what they may make for themselves in future, India and Pakistan are likely to be important importing chemical markets for generations to come. British chemical manufacturers should secure a large share of the business in those markets, and the Bombay office can be a valuable official link between home manufacturers and the respective Governments, and, of course, not interfering with but rather supplementing the services performed by members' selling agents.

"We were fortunate in having Mr. R. Murdin Drake to guide and support Mr. Shuttleworth in launching the Bombay office. I believe that Mr. Shuttleworth will prove to be the right man in the right place; it is up to members to use his services.

No Consultations on Germany

"We are still dissatisfied that the Control Commission for Germany has not seen its way to initiate those consultations with British industry which were promised by the Board of Trade over a year ago. We appreciate their difficulties in attempting to make Germany once again a self-supporting economic unit which has not to be fed at the expense of the British tax-payer, but we regret that they have not been willing to seek the advice of British chemical industry, which I am sure would have been of great help to them in their endeavours to put Germany—or at least the Western zones of it—on its feet, while providing adequate security for the future peace of the world.

"The new level of industry for the Western zones announced about six weeks ago means that as far as chemicals are concerned, Germany will be allowed to get back to her 1936 basis of production. We may, therefore, expect to find her again in due course as a powerful competitor in the world's chemical markets, and this at a time when we are asked to expand further our own export trade if we are to balance our imports and maintain our standard of living here.

"Since the annual report was written, the Swan Committee on patent legislation has published its final report. We should all study this carefully. One very important proposal which is of great significance to our industry will enable us in future to patent a new chemical compound as such, and not merely its method of preparation, as at present.

"We regret, and even more so do our colleagues in the Colour Users' Association, the likelihood that the old Dyestuffs Act which has been of such great service to both the users and makers of dyestuffs (and, I may add, to the country), will have to be repealed because of the Geneva agreements and replaced by a system of Key Industry Duties which, though it has been of great benefit to the fine chemical industry, does not possess the advantages and flexibility of the present system of regulating imports of dyestuffs by licensing.

"Relationships between the A.B.C.M., A.C. & A.E. and chemical associations affiliated to A.B.C.M. have been excellent throughout the year. I think they can, as they should, co-operate more closely on broad issues of mutual interest. Fortunately, there is a good deal of wisdom, tolerance and friendliness among chemical manufacturers, and not least in the highest places.

"We in organised chemical industry have no idea yet how the chemical export targets set up for us have been built up. We might have been able to offer some advice on that subject but we have elicited that we are to be told about it piecemeal, section by section. The A.B.C.M. and its affiliated associations should consult together on this subject, as our efforts may need to be co-ordinated.

"As in the past, chemical industry can be relied upon ceaselessly to undertake far-reaching research programmes, and apply the results in the ever-widening field which has no known boundary. In this connection, a continuous and increasing flow of graduates from the universities as recruits into the industry, will be needed.

"To-day, there is much evidence in British chemical industry of extensive and varied schemes, not only to increase the manufacture of existing products by improved methods, but also, to undertake the manufacture of new chemicals, so that, provided these can be carried through and the over-mounting capital and operating costs can be kept in check, we can be assured of the steady growth of British chemical industry.

"In view of the fundamental character of chemical industry as a supplier of raw materials and intermediates to other industries, it is essential that this fact shall be borne in mind by those responsible in the Government for sanctioning capital expenditure applications. Otherwise, if additional chemicals are not forthcoming, other industries may fail to reach their export and agricultural targets.

"Generally, the relations between employers and employed in chemical industry have for many years been of an excellent character. Question of wages, working hours and conditions are regulated admirably for most of us through our sister association—the A.C. & A.E., and I have no doubt that everything will be done, through the Chemical Joint Industrial Council, to ensure harmonious working in the future, so that employers and employed work together for the good of our country and our industry.

Goodwill and Help

"I am now come to the end of my second year of office as your chairman. It has not been an easy period. Many new and difficult problems have had to be tackled and often we have suffered from intense feelings of frustration. But through it all I have received nothing but goodwill and help from every member of the council and the association. Without these and the help of the affiliated associations in our recent discussions on relationships with the Government, I would not have been able to do what little I have done. I am indeed grateful, and thank you all most sincerely. In this expression of gratitude, I include the staff of the association who, from the director and joint managers downwards, have worked zealously on your behalf and given me every help and consideration I could have desired."

The chairman mentioned that at his suggestion the council had agreed to dispense with the association's annual dinner "in view of the serious position in which we find ourselves and the new restrictions on the supplies of food."

COUNCIL'S REPORT

SUGGESTED SCOPE OF GERMAN INDUSTRY

The 31st annual report, principally of the year ended May 31, 1947, but taking into account a number of activities up to August, refers to the progress of the Indian branch office at Janmaboohmi Chambers, Fort Street, Ballard Estate, Bombay, now one-year old, which is extending aid to 58 participating members, and reveals some of the difficulties encountered in preliminary work relating to post-war German chemical industry.

The continuous deterioration in the conditions in German led to the abandonment of the original plan for the level of German industry. The new plan for the combined U.S.-U.K. zones has not yet been announced, but is believed to include levels similar to Germany's 1936 production. It is expected that the previously announced permitted level of exports of dyestuffs and pharmaceuticals will be maintained, if not increased. These will be exported on a free for all basis, the only control being designed to secure the maximum return of currency.

All previous submissions from industry on the control of production and exports appear to have been abandoned and the promised consultations on policy were limited to certain selected industries. Even these were not implemented eventually, on the plea that the merger of the U.S. and U.K. zones made such consultations inopportune. Teams representing the pharmaceutical and dyestuffs industries were ready to depart, but were not allowed to go to Germany.

Reparations have been affected by this change in policy and it has now become clear that the original plans and the preparatory work of the technical reparations teams have been largely wasted; the chemical industry will obtain little, if anything, beyond a small amount of plant from dismantled explosive works.

The association continued, during the year, to organise technical teams to examine German chemical works. The scheme came to an end on June 30, 1947, and by this date the association had organised 43 association teams and participated in seven others on matters of chemical interest organised from other sources.

The council gave careful consideration to the conditions laid down by the Government under the Darwin scheme for the employment in this country of German scientists and technicians and pointed out that an obligation to publish the work carried out was contrary to normal commercial practice and would discourage the employment of such men.

A special meeting of the group chairmen and the association's representatives on the F.B.I. Grand Council was called by the chairman of council to consider the F.B.I. report on trade organisation and methods of contact between the Government and industry.

The council took note of the assurances by the President of the Board of Trade during the passage of the Industrial Organisation and Development Act that the Government had every intention of proceeding by agreement rather than by compulsion and did not wish to impose a development council on an unwilling industry.

Chemical industries have played a leading part in the export drive; chemical exports for 1946 amounted to just over £66,000,000, or nearly three times the 1938 value. Allowing for price changes, this represents the figure of 162 on a volume basis as compared with 100 for 1938. For 1947, the target figures are 165 per cent by volume for chemicals and 140 for our export trade as a whole.

Chemical Plant Exports

The council has expressed concern at what it feels to be the short-sighted policy of exporting chemical plant so badly needed in this country; such exports can provide only a temporary and largely non-recurring benefit, as compared with the continuing return which would result from the use of the plant in the U.K., thus giving increased production and exports of chemicals. Rehabilitation and extension of the British chemical industries should have first claim on the supplies of plant and equipment.

The council protested against the cessation of regular period allocations of steel for repairs and maintenance and took up the question of shortage of drums, which is likely to prove serious having regard to the nature of the products to be transported.

The council pressed for the appointment of someone with a knowledge of the chemical industry, as one of the basic industries of the country, to the Government Economic Planning Board, and welcomed the appointment of Sir William Coates (a deputy chairman of I.C.I.) in this capacity.

A joint statement on behalf of the users of benzol and toluole was presented to the Board of Trade to justify the concern felt by users of these products over the effects of present prices of these essential raw materials on exports and long-term developments.

Dr. G. Malcolm Dyson and Mr. Foster Sproxton were nominated to the Chemical Council to fill the vacancies caused by normal retirements by rota. The association's representatives are now Mr. R. Duncalfe, Dr. G. M. Dyson, Sir Harry Jephcott and Mr. Foster Sproxton.

The joint panel of the Ministry of Labour with the Ministry of Education, on which the association is represented, has selected a number of candidates to take the special courses in chemical engineering mentioned in the last report. As they have completed their courses, particulars have been sent to the members known to be interested with a view to employment. The scheme seems to fulfil its short-term object in reducing the scarcity of chemical engineers, but progress is still slow as regards the extension of university courses on a long-term basis.

Coal Supplies

Following the cut in fuel allocations to 50 per cent in February, 1947, the council took steps to urge on the Board of Trade the importance of chemicals as basic raw materials for most other industries, and the consequent need for the industry to be given the top priority for coal supplies, plant and containers. The Board of Trade accepted this view, but pointed to the sheer physical shortage of coal and the transport hold-ups.

Monthly production figures are being collected from members in comparison with November, 1946, and raw materials shortages found to be causing exceptional difficulties are reported to the Board of Trade which has, in some cases, recommended extra fuel allocations for these materials.

Production dropped in February and March to approximately 50 per cent of November, 1946, but recovered to about 80 per cent in June, 1947, the earlier effects of direct shortage of fuel giving way to indirect effects of secondary shortages of raw materials, containers and packaging, which were themselves caused by fuel shortages.

Further discussions have been held with the British Chemical Plant Manufacturers' Association regarding deliveries of chemical plant. The plant makers attributed the main difficulty to certain bottlenecks which were aggravated by the present shortage of steel, and especially of sheet stainless steel. It was felt that closer co-operation by chemical manufacturers with the plant makers at the earliest possible stage would be helpful.

The conflict between home and export was admitted, but it was felt that, while the association had to advise the Board of Trade of its difficulties, every effort should be made to solve the problems involved by discussion and co-operation between the two associations without Government intervention. A scheme for dealing with orders, primarily from abroad, which call for process details as well as plant, has been agreed between the two associations and circulated to all members.

The President of the Board of Trade informed a joint deputation from the association and the Colour Users' Association that if, as was hoped, agreement were reached at Geneva for the abolition of all prohibitions on imports, then the Dyestuffs Act would have to be repealed. The President promised, however, that in that event substantial tariff protection would be given to the dyestuffs industry. Following discussions with the Colour Users' Association, a joint request has been submitted to the Board of Trade asking for dyestuffs to be brought under the Safeguarding of Industries Act, and given a Key Industry Duty of 33⅓ per cent, but only in the event of the repeal of the Dyestuffs Act. The request asks for continuation of the present duty-free access to products not made in this country or not available in adequate quantities, and the retention of the present licensing procedure.

Fuel Efficiency

The Fuel Efficiency Committees have continued their work on behalf of members. The Manchester Committee completed a series of follow-up visits and has decided that in present conditions of poor-quality coal, variations in sources of supply and similar disturbing factors, there is little more to be expected from the generation side. It has lately turned attention, therefore, to the possibility of achieving economies in the use of fuel and power in process plant.

The London Committee has visited a number of members' works and inspected boiler and plant installations. These visits have been of particular value in enabling difficulties to be discussed and ideas exchanged on the spot by means of an "inquest" at the end of the day.

Group B, which is concerned with fine chemicals, has under consideration the action to be taken to obtain an extension of the Key Industry Duty, which is due to expire in August, 1948. It was decided that in the first instance steps should be taken to inform Members of Parliament, trade union officials, etc., of the vital importance of the continuance of a virile fine chemical industry. It was visualised that the Government would await the outcome of the International Trade Negotiations and then set up a committee of inquiry as on previous occasions.

During the year considerable oral evidence in support of the Memorandum of the Joint Chemical Committee was given before the Board of Trade Patents Committee, 1944. This latter has completed its hearing of evidence and it is expected that a further report (probably in the form of a final report) will be issued.

The association has received from the Ministry of Supply a considerable number of patent specifications relating to inventions arising from research carried out in Government departments during the war. These specifications have been brought to the notice of all members of the association, who have thus been given an early opportunity of acquiring licences to operate these inventions.

Tar Distillation Products

Group C has continued to work in close co-operation with the Association of Tar Distillers on all aspects of coal tar distillation, and regular joint general meetings of the two bodies have been held in Leeds every two months throughout the year. Tar distillers continued to co-operate in and support the work of the British Tar Confederation, and especially pressed for the early implementation of the plans for a Coal Tar Research Association.

Arrangements were made with the Coal Tar Control that in the case of tar products at controlled prices going into the manufacture of goods for export, if the seller and the buyer were agreed, an application could be made to the Controller for a special premium price in respect of such supplies.

The association submitted to the Board of Trade a co-ordinated statement on the general non-tariff aspects of international trade policy, raised in the White Paper Cmd. 6709, together with detailed views on the tariffs of the Dominions and Colonies, with schedules of the tariff concessions on chemical items sought from the various nations concerned.

A statement was also submitted on Imperial Preference and on the import duties into this country which it was considered essential to maintain, and those where a reduction would not be opposed.

In accordance with the Government's promise, the association has been consulted regarding various tariff items in the negotiations at Geneva. The council welcomed the specific statements on Imperial Preference by Sir Stafford Cripps at the opening session.

Safety

The Joint Committee with the Association of Chemical and Allied Employers recommended that the association should resume its work on the technical aspects of safety, while the A.C. and A.E. dealt with questions of education, training and welfare up to, but excluding, professional level.

Part I of the Model Safety Rules for use

(*Continued on page 536*)

Fertilisers and Fish

Favourable Experiments to Improve Fish Yields

IN the past few years remarkable advances have been made in our knowledge of chemical influence upon marine biology. It would be no exaggeration to say that a new and enormous field for fertilisers has been opened. To what extent a large-scale development is practicable, and, if practicable, to what extent it would be economic, are questions which are unusually difficult to answer despite the exceptional success of the first "pilot" experiments. We seem to be faced with another technical achievement for which the world is perhaps not yet ready.

Marine Biology

The significance of the chemical story cannot be appreciated without a simple preface in marine biology. Fish live mainly by consuming each other. Cod prey upon herring, plaice on molluscs and sea-worms, haddock on starfish and sea-worms, and so on. There is an eternal warfare of hunting between the species, and even within a species adult fish often consume their juniors. Fish nutrition is mainly a carnivorous equilibrium, but it rests upon a vegetarian foundation. The enormously prolific minute sea creatures derive their nutrition from the floating microflora known collectively as plankton, which vary from 2μ to 50μ in diameter; in turn, the small sea creatures provide the diet of sprats, herring, and other fish. Thus, the food supply of even the most carnivorous species depends fundamentally upon plankton.

The planktonic plants depend upon photosynthesis for their energy supply, and their development is confined to surface layers within reach of the sun's penetration. Their reproduction process is one of division, a splitting into two parts at a certain growth-stage. One of the principal kinds is the diatom, a minute plant which lives encased in two silica shells "sharp at both ends." Although the energy for growth is derived from light and the multiplication process is bacterial rather than vegetable in type, these floating plants require simple nutrients just as land plants, and the major limitation upon plankton flowering is a shortage of these nutrients in the surface waters, particularly of nitrogen and phosphorus. Consequently there is a vigorous burst of plankton development each spring, but within a month or two months the nutrient supply is spent or is so reduced that further flowering can only compensate the consumption of plankton by microscopic creatures. This exhaustion of nutrients is most marked in deep waters. The sun constantly warming the upper layers reduces their specific gravity, making mixture with the lower layers increasingly difficult. Although the unused nutrient supply of the waters below could easily support further plankton flowering, this supply is isolated by the temperature effect, and it is not until the cooling of autumn that the division between upper and lower layers—known as the thermocline—is breached. This is followed by an autumnal burst of plankton growth, but this lasts only so long as the sun can continue to supply enough penetrative energy.

This is, however, an over-simplified picture. For a fuller account in simple terms reference should be made to Graham's book, "The Fish Gate." There is, for example, one part of the southern North Sea where what is called the Dogger Bank Swirl enables the nutrient supply of deeper sea layers to replenish with some regularity the planktonic upper layers, and this gives rise to a plankton bed of vital importance to North Sea fishing. In general, however, the production of plankton seems limited to these seasonal peaks of spring and autumn; in seas where there is little seasonal cooling the surface layers remain constantly isolated from deeper nutrients and plankton growth takes place at a feeble rate. Despite the dependence upon photosynthesis, plankton production is more vigorous nearer the poles, and R. S. Wimpenny has illustrated this by comparing annual fishery yields according to latitude; thus, North-West Europe yields are some 3,200,000 tons whereas Australian yields are only 30,000 tons and Mexican yields only 6000 tons. In warm seas where the thermocline is not seasonally broken, economic fishing-grounds are found only where agitation of the water layers is set up by river entrance or other land influences.

Plankton and Zooplankton

The plankton beds become fairly quickly associated with animal life, with innumerable transparent and not very mobile forms of sea life, fish spawn and floating larval fish, and this mixture is often called zooplankton. Zooplankton has a longer persistence than the entirely vegetable plankton, and to a great extent the gap between the spring and autumn flowerings is bridged in this way. Nevertheless, there is abundant evidence that the total fish population is restricted by food shortage. The theory of the danger of over-fishing is based upon the assumption of a top limit to the stock of fish in the sea, and this assumption would seem to be amply justified by the realisation in this century that there is indeed a very real danger of over-fishing. All the improvements in fishing methods have not produced more fish—briefly, greater and greater efforts in fish-hunting have been required to maintain yields. The decline in North Sea catches was arrested only by the cessation of fishing during the 1914-1918 war, and the same decline was soon evident again after heavy landings in 1920. The danger of over-fishing has ceased to be a theory to be investigated by Royal Commissions; its reality proves that the fish population of the seas has a limitation, and this in turn would seem to be fixed by the available food supply, by the nutrient limitations upon plankton production.

The significance of influencing plankton production by the addition of nutrients to the sea's surface layers can only be assessed against this general background. If the limitation to plankton growth can be adjusted by chemical assistance, it may be possible to reduce the danger of over-fishing and to revolutionise the economics of the fishing industry. Nothing else seems able to make a positive contribution. International agreements to restrict total landings per year to some safe figure merely ensure that the effort and operation of catching does not become more and more expensive per unit weight of fish, and that actual decline in annual tonnages does not eventually set in. These controls are negatived or at best static. Judged as an idea, therefore, the proposal to use chemical fertilisers to stimulate plankton growth strikes at the root cause of the fishing industry's basic problem.

Fertilisers being introduced into the lake from behind a motor-boat so that the propeller thoroughly mixes the fertiliser with the water

How far has the idea been justified in preliminary practice? British experiments began in 1942 on the west coast of Scotland, Dr. Gross, of the University of Edinburgh, leading a small team in co-operation with the Millport Marine Biological Station and Imperial Chemical Industries. Loch Sween, an inlet on the Sound of Jura, was selected —it is, by the way, to be found in map 38-E3 of the A.A. Handbook, a reference that may help geographically-minded readers. A very small tributary loch, Loch Craiglin—about a quarter of a mile long and rather less in width—was isolated by damming the connecting channel. Tidal movement, therefore, was eliminated in the first pilot test. From March, 1942, nitrate of soda and superphosphate were added to the loch at intervals, shovelled in behind the propeller of a motor-boat to ensure dispersal. A large number of small plaice and flounders were introduced to the loch.

Fertilisers Rapidly Assimilated

Subsequent examinations showed that the spring surge in plankton growth was sustained during the summer months and that the population of the minute marine organisms that feed on the plankton increased to a marked extent. A most significant fact was the rapid uptake of the added fertilisers which were apparently assimilated by the plankton vegetation within a few days. The effect on the larger fish was equally pronounced, though longer-term. In the fertilised loch, flounders grew twice as rapidly as similar flounders in the adjacent Loch Sween, which was used as a control. Estimates showed that Loch Craiglin would produce flounders of marketabe size in three years as compared with the normal six years under "natural" conditions; the plaice "samples" being ten inches long in two years as against the usual four to six years.

Any generalised deductions from these results were, of course, limited by the fact that the loch had been turned into an enclosed basin. The next step was to conduct similar experiments in a loch open to tidal influence. For this another arm of Loch Sween was selected—Kyle Scotnish, over two miles in length and about 160 acres in area. Each month 38 cwt. of nitrate of soda (or 30 cwt. of sulphate of ammonia) and 12 cwt. of superphosphate were added. The size of these dressings must be considered in relation to the "water acreage." As Dr. D. T. Gauld has pointed out in a recent paper on this work (*Discovery*, Jan., 1947) these amounts on a per-acre-per-annum basis work out at 2¼ cwt. of sulphate of ammonia and 100 lb. of superphosphate. Such rates of application would certainly be exceeded on land by most modern farmers; indeed, the figure for the phosphatic fertiliser would be quite small for many soils.

Before the work on Kyle Scotnish Dr. Gross had been confident that tidal losses of the added nutrients would be very small. The rapid uptake of the nutrients in Loch Craiglin, the general evidence from marine physics that sea water "zones" with only small differences in density do not easily admix, and the fairly static habits of plankton beds even in running rivers, all these indications tended to suggest that Kyle Scotnish results would be similar to those of the enclosed loch. This opinion was quickly confirmed. The tidal movement of the nutrients could be followed down the long arm of the loch during the short time after addition and before assimilation; and nutrients that shifted at low tide into the channels joining Kyle Scotnish to Loch Sween could be traced back to the main basin at high tide. It seems clear that losses due to tidal water movement were insignificant. During the summer the population of the minute forms of sea life was three times that found in the parallel arm of Loch Sween, Sailean More. A threefold increase was also measured for the population of crustacean animals and various inhabitants of the sea-bed which also depend upon plankton for their sustenance.

Phenomenal Growth of Plaice

Within the second year of the Kyle Scotnish experiment, a substantial mussel population had been "created," while it was found that plaice fry grew at about five times the normal rate in their first six months, and were eight inches long and a quarter of a pound in weight after eighteen months. At this stage of development plaice naturally migrate to deeper water and they left Kyle Scotnish. Dr. Gauld's deduction that the Kyle Scotnish plaice would have reached marketable size in two years as compared with the minimum normal period of three years is, if anything, a conservative assessment.

Confirmation of these effects comes from somewhat similar experiments in Canada. Trout fry after four years in an inland lake were averaging a weight of three-quarters of a pound; a complete fertiliser addition was then made (potash is required for fresh-water plankton although in sea-water the potassium content is much more favourable than that of nitrogen and phosphorus) and a year later the average weight was one pound and a half.

It is abundantly evident from these exploratory results that fertilisers can increase fish growth. Indeed, the "differences" measured in Scotland between the treated areas and the adjacent untreated areas are much larger than the differences of agricultural plot tests; we have threefold and doublefold increases as compared with yield gains on land of fifty per cent or so. And the marine fertiliser effects are likely to be greater still when measured over a long period; the effect upon particular fish and their growth-rate is one gain, but the possible increase in the number of fish growing would be another. Fish produce eggs by the hundred thousand, and there is little doubt that the extraordinarily low rate of reproduction—extraordinary in relation to the number of eggs spawned—is a consequence of the scarcity of food for all forms of sea-life. This potential gain through fertiliser application is, of course, purely hypothetical and so far untested. The increase in the Kyle Scotnish mussels might be regarded as an indication on these lines, though perhaps marine biologists would suggest that the population increased as a result of immigration.

A National Responsibility

The Scottish experimental work has now ended save for further observation of the longer-term effects from the fertiliser applications already made. The next phase—the extension of the work to open sea and deep-water fishing-grounds—is a project for national rather than individual enterprise; indeed, international enterprise is ultimately required. Scientific progress has provided a problem in politico-economics, and it needs little thought to see that the problem is cumbersome. Nationally the inshore waters are "common land" and any citizen may set forth to take what he can catch of the "harvest"; internationally the open sea is a no man's land and the catches belong to those whose nets pull them in.

A national experiment within our territorial waters should be conducted as the next phase. For this, national expenditure and some form of agreement to prevent commercial fishing in the selected area save under scientific direction would seem to be the principal actions required. Should such a test prove as hopeful as the Scottish experiments, an international experiment—the application of fertilisers to a fishing ground in, say, the North Sea or even in Arctic waters—should be tried. If international co-operation could be won for the test, it could hope to be won and maintained for the regular application of any beneficial results. Britain would seem to have a notable opportunity to give Europe a historic lead in this matter.

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American Chemical Notebook

From Our New York Correspondent

RETURNING from a two-month business trip by air to eight European countries, where he conferred with his company's representatives, Edward Rosendahl, executive vice-president of the Glyco Products Company, Inc., which has plants at Brooklyn, New York, and New Martinsville, West Virginia, stressed the effects of the dollar shortage abroad and the difficulties of foreign exchange as obstacles to American manufacturers seeking to capture European chemical markets formerly held by German cartels. Europe, he said, requires vast quantities of chemicals and the drastic shortages in most lines are a key factor in retarding the pace of rehabilitation. Because of the lack of dollar exchange expenditure was generally being confined to foreign manufactured goods or raw materials which could be converted into products for profitable re-exports. European chemical manufacturers at present were working at full capacity, he said. The German plants, especially I.G. Farben, were operating at "a surprisingly high production rate under American and British control."

* * *

The heaviest substance known, the synthetic element 96, curium, has been isolated for the first time in pure form in sufficient quantity to be visible to the naked eye. This has been reported by Dr. Isadore Perlman, nuclear chemist in the University of California Radiation Laboratory, as a result of research sponsored by the Atomic Energy Commission. The extremely interesting, tiny quantity of the element is so radioactive that it gives off a visible glow. It was produced by the Atomic Energy Commission in the atomic pile, and isolated by L. B. Werner, working with Dr. Perlman in Berkeley, California. With Dr. Perlman's announcement, all four of the synthetic trans-uranic elements, neptunium, plutonium, americium, and curium, have now been isolated and studied in the laboratory by University of California scientists.

* * *

The outlook for chemicals for the second half of this year is favourable, even though some curtailment of export trade may occur, according to the current issue of *Chemical Engineering*. "In the first place," that journal states, "productive facilities have been broadened and, equally important, consuming industries appear to be in a position where they can readily absorb the full volume of chemical production. The first six months' output of sulphuric acid is reported as 4,973,715 tons and if this production rate is maintained over the remainder of the year, the twelve-month total would draw close to 10,000,000 tons or more than the combined government and private plants produced at their wartime peak. Soda ash, which still is listed as scarce, was turned out in the first half of this year at an average monthly rate of 397,000 tons or about 4000 tons a month ahead of the record rate set in 1944. The rise in ash production has come largely from expansion in the natural ash branch which promises to become still more important. A new deposit is being opened in Wyoming."

* * *

The Stock Exchange firm of Merrill Lynch, Pierce, Fenner & Beane in its current booklet entitled "Chemicals," declares that the long-term potentialities of the U.S. chemical industry are excellent. Reviewing the position of thirty leading chemical companies, the investment firm asserts that "as a whole the industry has been a leader in research resulting in the constant development and marketing of new products." Demand for chemical products was strong and the supply of many chemicals was not adequate for industrial requirements.

* * *

Production of inorganic chemicals in the United States once again has declined slightly. Figures for July, just released by the Bureau of the Census of the United States Department of Commerce, show a slight drop in comparison with June, although total production remained at a relatively high level. A survey of 35 industrial chemicals disclosed that 19 were produced in smaller quantities in July than in June, and nine at a rate lower than in July a year ago. Chemicals whose production fell in July but was still higher than a year ago include the acids—nitric, phosphoric (except from phosphate rock) and sulphuric—chlorine, oxygen, caustic soda and salt cake. Those chemicals for which recorded production fell below last year's figures were: chrome green and molybdate chrome orange, dibasic calcium phosphate, lead arsenate, silver nitrate, sodium bicarbonate, and natural methanol. Record high production of carbon dioxide (liquid and gas and solid), natural soda ash, and phosphoric acid from phosphate rock was achieved during the month. Calcium arsenate and hydrogen were produced in larger quantities this July than during any month in several years.

* * *

Professor E. K. Rideal, Director of the Royal Institution, was guest speaker at a recent gathering of the research and technical staffs of the Calco Chemical Division, American Cyanamid Company, Bound

Brook, New Jersey. He observed that advanced mechanisation of industrial technical laboratories and the remarkable instrumentation of American industry held important economic implications. British industry, he said, had not been able to effect any substantial plant modernisation during the war years, since their chief problem was one of survival.

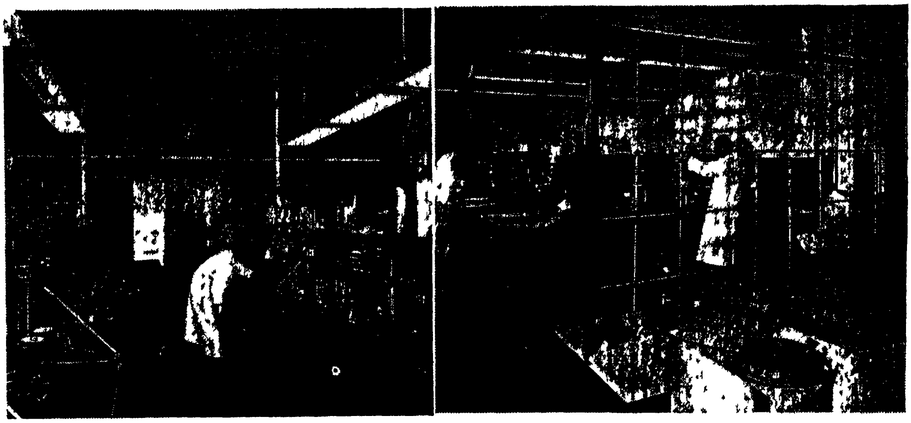
* * *

Fertiliser production in the United States is expected to reach the record figure of 17 million tons in 1947-48, F. S. Lodge, of the National Fertiliser Association, predicted this week in a report to the American Chemical Society. He said that an output exceeding 20 million tons would be possible with the plant facilities now available, if no shortages of labour, transportation or raw materials developed. For the year ended June 30, he said, consumption totalled about 16 million tons, or more than double the average for the years 1935 to 1939. Replying to charges that the industry has tried to keep on the market fertilisers of low plant-food content, Mr. Lodge said that the industry had long advocated raising the plant-food content of its product as rapidly and as much as the economic use of the available materials would permit and as agronomic research would advise.

* * *

Exceptional facilities for research chemists in textiles are provided by the opening at Summit, New Jersey, last week, of an ultra-modern research centre of 140 rooms for the Celanese Corporation of America. The provision of an annual "professional progress award" in chemical engineering of $1000 to be administered by the American Institute of Chemical Engineers was announced at the formal opening of the centre by Mr. Harold Blancke, president of the corporation. This, said the secretary of the American Institute, was the first major honour provided for achievement in chemical engineering, as distinct from the literature of the subject. The new centre, explained Mr. George Schneider, the corporation's technical director, was to co-ordinate the many separate laboratories and pilot plants. Centralisation was essential, especially for the more basic problems of chemistry and physics. The new central laboratories are staffed with groups of cellulose, synthetic organic, dyestuff and physical chemists and chemical engineers. A major portion of the personnel was transferred to Summit, N.J., from the company's research departments at its Newark, N.J., and Cumberland, Maryland, plants. Important development work is still being carried on at the other two plants, while pilot plants with equipment in the new plant includes one of the first five General Electric Company recording spectrophotometers, an electron microscope and a new device for measuring molecules.

NEW RESEARCH CENTRE FOR U.S. CELANESE



Thought to be the most versatile chemical laboratories in the U.S.A., the new central research department which the Celanese Corporation of America has just opened at Summit, New Jersey, includes (left) a cellulose chemistry section equipped to deal with all problems of refinement for textile and plastics uses and (right) a central research laboratory stated to be capable of analysing virtually any chemical compound. Pilot laboratories for further development work and high-pressure synthesis are now being added

(*Continued from page* 530)

in Chemical Works has been completely revised and rewritten by a panel under the chairmanship of Dr. Diamond, of the British Plastics Federation, and is in the hands of the printers. It has been submitted to, and approved by, the Chief Inspector of Factories.

A draft scheme for Part II, the detailed textbook on safety in the chemical industry, has been prepared and provides for the compilation of the various sections by expert technical panels. Information is being assembled in connection with the revision of the methods for the detection of toxic gases under works conditions.

At the request of the Factory Department, the memorandum on precautions in connection with the operation of stills (as distinct from cleaning), originally drawn up in 1936, has been revised by a joint panel comprising representatives of the association, the Association of Tar Distillers, the British Chemical Plant Manufacturers' Association, the Institute of Petroleum and the Factory Department. A programme of research is being drawn up on the problem of papilloma of the bladder.

Road Transport

The Traffic Committee has given special attention to the subject of nationalisation of inland transport.

In April, 1946, when it was evident that the Government intended to proceed with its policy of nationalisation, a letter was sent to the Ministry of Transport setting forth the views of the association and, in particular, pointing out that owing to the nature of its products the chemical industry has certain special problems which do not arise in the case of other industries.

A reply received suggested that a memorandum should be submitted outlining the special features to which it was considered the Minister's attention should be drawn. A memorandum on the lines indicated was prepared and was sent to the Minister on September 20.

The representations made therein undoubtedly had considerable effect on the original drafting of the Bill, particularly in connection with liquids carried in bulk: chemical manufacturers were exempted from the necessity of obtaining permits for delivery in tank vehicles over all distances.

Dangerous Goods by Road

The Explosives Department of the Home Office resumed consideration of draft regulations for the conveyance by road of inflammable liquids and corrosive acids. These regulations were the subject of long discussions between the Home Office and this association during the years 1934/6, and a sub-committee has re-examined the amended draft regulations. Following negotiations with the Home Office many valuable concessions have been secured, and a final draft will be submitted for approval by the full committee and recommendation to council. The Home Office has intimated that these regulations will be put into force on January 1, 1948.

Following the publication of the Road Haulage Association's Conditions of Carriage, which, incidentally, were drawn up without consultations with trade and industry, the Traffic Committee decided that these conditions were unreasonable and should not be accepted until they had been fully considered and suitably amended. The Traders' Co-ordinating Committee on Transport was informed accordingly and a schedule of suggestions and amendments has been submitted, with a request that these be considered when negotiating with the Road Haulage Association.

The Council

The following were appointed to constitute the association's council for 1947-48:—

President: Dr. P. C. C. Isherwood; *vice-presidents*: Dr. F. H. Carr, Mr. R. Duncalfe, Dr. E. V. Evans, Messrs. C. A. Hill, C. F. Merriam, L. P. O'Brien, R. G. Perry.

Elected members: Chairman: Sir Harry Jephcott; vice-chairman: Sir Frederick Bain; honorary treasurer: Mr. C. E. Carey.

Mr. T. R. G. Bennett, Mr. A. D. Daysh, Dr. A. E. Everest, Messrs. C. G. Hayman, G. E. Howard, W. M. Inman, W. F. Lutyens, T. D. Morson, D. P. C. Neave, F. G. Pentecost, K. H. Wilson, H. Yeoman

Co-opted members: Mr. D. Spence, Lord Trent, Mr. S. W. Whiffen.

Honorary vice-presidents: Mr. N. N. Holden, Lord McGowan. *Director and secretary*: Mr. J. Davidson Pratt. *Joint managers*: Mr. R. M. Drake and Mr. A. J. Holden.

NEW CZECHOSLOVAK DRUG

The Interpharma Pharmaceutical Works, one of the leading companies incorporated in the Nationalised United Pharmaceutical Works, has started the large-scale production of a new drug in the dicoumarol series, called Pelentan; it has been synthesised and developed by Rosicky. This, according to investigations conducted by Professor Netousek at one of the Prague hospitals and by Professor B. Prusik at the Clinic for Internal Diseases at Prague University, has proved effective in the treatment and prophylaxis of thrombosis without undesirable side-effects and difficult laboratory control. Professor Prusik has furthermore been able to demonstrate its efficacy in the treatment of certain diseases of the small arteries, especially in the case of Buerger's disease.

FANS FOR THE CHEMICAL INDUSTRY

How New and Traditional Materials are Adapted

THE first requirement of all enduring work by the chemical engineer is the successful adaptation of the right chemically-resistant material to a particular plant. The force of that truism is seldom more evident than in the designing and application of fans which form an essential part of all plants in which gas is generated designedly or otherwise, which is almost equivalent to saying the entire range of chemical industry.

The problem of providing enduring exhausting equipment which will stand up to destructive gases and vapours has been greatly simplified in some directions by the production in recent years of new materials; but, even with these, the problem still remains in some specialised departments and it is interesting to note how often it is still necessary to resort to the oldest of traditional materials, such as earthenware, wood and lead.

Merits of Wood

A useful summary of this aspect of chemical engineering is the current descriptions in the *Sulzer Technical Review* of a number of fans used for various purposes in American chemical industry.

At the moment, few materials are known which are thoroughly suitable for withstanding mechanical and chemical action and which can at the same time be economically employed for nearly all chemical processes. For weak chemical reactions, wood may be regarded as such a universal material, especially when it can be improved by being impregnated in a manner suitable for the processes in which it is to be used. As long as the moisture content does not exceed certain limits, wood is usually very resistant to the corrosive action of gases and vapours produced in fume cupboards. This material also, however, is destroyed by concentrated acid vapours.

Many of the paints used as protective media against acids behave in a manner similar to wood. Metals such as copper, lead, aluminium and some special steels are very resistant to the action of certain chemicals. In other processes where they are not resistant they may nevertheless be used when the price of the material does not affect the economy of working, and when there is no danger of the product itself being contaminated.

One task of the works chemist is to investigate the chemical resistance of materials and then to determine what substances are to be used for making certain apparatus and machines. The designer has then to ascertain whether the physical properties of the material, particularly its strength, will be sufficient to allow a reliable apparatus or machine to be made from it.

The most useful information is obtained from the particulars gained from practical work in existing plants. In some cases a more or less definite idea of the chemical resistance of a substance can be derived from experiments made with test-pieces.

While the difficulties to be overcome in designing fans for the chemical industry mostly concern the nature of the material, the designer is faced with other difficult problems arising from the limitations on his choice of material.

To take a particular example, it is not seldom the case that the actual fan is only a supporter of a chemically-resistant lining. This lining is used to cover all the surfaces which may come into contact with the gases and vapours to be handled by the fan. Apart from making sure that the lining will be certain to adhere to the supporting material, care must be taken in such fans to see that suitably shaped passages are provided for the gases and that the spaces between the rotating and the stationary parts are sufficiently gas-tight.

Inert Gases

The smallest departure from normal designs will be found in fans which have to handle neutral gases. From the chemical point of view, no special stipulations need to be made regarding the material in such cases. It will often be found sufficient to pay particular attention to the design and execution of the stuffing-box and to choose for it a packing with grease lubrication in order that the shaft may be as gas-tight as possible. If the gases to be handled are, for instance, of an explosive nature, the impeller will be made of aluminium so that no sparks may be caused should it come into contact with the stationary parts.

For other types of fans it is sufficient to cover with an acid-resistant paint the surfaces coming into contact with the gases. The material for the fans themselves has then only to satisfy the demand of adequate strength. In this manner the machines can be constructed much less expensively than if a costly special material were necessary. As, however, a protrecting paint is always liable to damage which might reduce the life of the fans, Sulzer Brothers have developed special designs for such cases.

In these designs, sharp angles are avoided and the thickness of the material is chosen in such a way that all corners can be well rounded. Whenever practicable, all the parts are given as rounded a shape as possible in preference to a mere chamfering at the edges, where the radius of curvature would be limited by the thickness of the material. The number of bolts is reduced to a minimum, since the protecting paint might be damaged when spanners are used to tighten or loosen the nuts.

A low-pressure centrifugal fan, with rounded corners and angles and protected with an acid-resistant paint, is used for withdrawing gases and vapours from different fume cupboards. The delivery and suction branches are made of earthenware, the former being rectangular and the latter of circular cross-section. The stand carrying the motor is built up of tubes, since a stand made of flat or sectional iron would again have too many sharp corners.

In another vertical fan with protective paint the suction branch is cemented to a stoneware pipe and caulked with acid-resistant material. The motor driving the fan has the impeller keyed to its shaft and is flanged to a shielding disc on which four specially-shaped flat-iron pieces are welded and are supported by a common foot ring. This part of the fan is mounted on the suction branch with asbestos packing, and is not provided with any further fixing means.

Such fans improve the draught from the fume cupboards of laboratories and are suitable for fitting on the roof of the house; here they can easily be inspected when required.

Moisture Factor

Fans made of wood, provided that the gases or vapours handled do not contain much moisture and are not too concentrated, have proved to be less sensitive than the fans already described, which are exposed to the danger of corrosion should their protecting coat of paint suffer accidental damage.

Of course, it is necessary when designing such fans to consider the warping of the wood, which makes itself felt, particularly in a direction transverse to the fibres, and must be counteracted by a suitable arrangement of bolts and tie-pieces. These elements at the same time ensure the durability of the machines. On the other hand, all metal parts which may come into contact with chemical fumes must be given appropriate protection.

Among the types of fans made with two materials are those lined with ebonite. The mild steel chosen for these fans because of its suitability for standing mechanical stresses is at the same time the supporter of the chemically-resistant material. The ebonite lining is easy to fit and affords complete protection for the ironwork as long as it is not damaged by mechanical stresses.

In a small low-pressure centrifugal fan the impeller and the interior of the casing are covered with ebonite. The insertion of the lining is facilitated by the fan being divided into two in the horizontal plane through the shaft. Another such fan is designed to run at 2900 revs. per min. and the ebonite covering has remained in good condition even at that speed. These fans already have several years of successful service to their credit and proved satisfactory from the first.

Other Materials

Constructional materials which find a wide use in apparatus and machines for the chemical industry are the various special steels containing chromium and nickel. In a number of manufacturing branches these materials have proved to be very satisfactory in practice. Their price, it is true, is considerably higher than that of ordinary steel.

But since in the case of fans it is generally sufficient to have only the inner parts of the casing made of special materials, the cost of such designs will, in by far the great majority of cases, not go beyond an economically reasonable limit.

There are numerous uses to which fans made of such steels can be put, and consequently there are also numerous different designs. A high-pressure centrifugal fan has been designed in chromium-nickel steel for handling highly corrosive acid vapours, against which even the very best steels obtainable are not completely proof. Casing and diffusor consist of thick seam-welded steel plate, while the connecting flanges are made of mild steel and rest loose on the branches. The speed of the fan is 2900 revs. per min. Its rotor is carried in one bearing only, since it is rigidly coupled to the rotor of the motor. Under the fan casing a drain is provided for the condensate from the damp acid vapours that are handled.

Fully Protected

In some chemical works, corrosive gases and vapours are not only handled by fans, but are also present in the rooms in which the machines are placed. Then the fans must have not only the impeller and casing but also the bearing support made of special resistant material.

For certain branches of chemical manufacture, hard lead is a fairly resistant material. But because of its small mechanical strength and its high specific gravity, this material is not very suitable for use in machines. It is nevertheless used in certain cases, such as the fan with a casing made of hard lead and an impeller of bronze. The impeller is covered with a homogeneous layer of lead 3 mm. thick; the fan is supported on a cast-iron bearing pedestal and bedplate.

NEW RESISTANT GLASS

Withstands Hydrofluoric Acid

A RADICALLY new type of acid-resisting glass utilised in experiments leading to the development of the atomic bomb was described by Dr. Aristid V. Grosse, research director of the Houdry Process Corporation, Marcus Hook, Pennsylvania, at a recent meeting of the American Chemical Society. The new glass contains no sand, resists the corrosive attack of hydrofluoric acid and uranium hexafluoride, chemicals that disintegrate ordinary glass. "The dream of every fluoride chemist to have a transparent and practically usable material for work with the acids has now been realised," he said.

Developed by scientists of the American Optical Company, Southbridge, Massachusetts, the new product was used in experiments with uranium hexafluoride, the essential chemical utilised to separate the fissionable uranium 235 isotope from the more common uranium 238. The new glass will simplify the handling of hydrofluoric acid in scientific experiments and many important industrial operations, particularly oil refining and synthetic rubber manufacture. Previously, the acid could be shipped only in lead or wax containers, and in the laboratory it had to be processed in platinum or gold retorts which prevented visual observation of chemical reactions.

Comparative Test

To determine the acid-resisting property of the new glass during its development, a piece was immersed in a bath of hydrofluoric acid for 50 hours. At the end of that time the glass was substantially transparent, and to the naked eye showed no obvious attack. At the same time, a piece of ordinary glass made of sand, lime and soda was immersed in the acid and in a few hours was converted into a chalky mass. Even the tough and seemingly indestructible glass used in the manufacture of laboratory and kitchen-ware was rapidly attacked.

To obtain hydrofluoric acid resistance it was necessary to dispense with sand as a major ingredient because the acid instantaneously attacks and disintegrates sand. The major ingredient of the new glass is phosphorus pentoxide.

Plans for the manufacture of the new glass are now being made. Its potential uses, Dr. Grosse said, are in the fabrication of test tubes, beakers, bottles, evaporating dishes and other containers; window panes for laboratories and factories where acids are employed; lenses for safety goggles and helmets; and glass gauges to observe and check the action of acids in metal cylinders and reaction vessels.

POLISH BICARBONATE

Largely Increased Production

SODIUM bicarbonate production with an output in 1939 of 99,500 tons, and last year of 113,800 tons, represents an important branch of the Polish chemical industry. Pre-war production, principally at the two factories of Matwy and Borek Falecki, was almost entirely in the hands of "Solvay" whose works have now been nationalised. Home demand more than exceeds the supply available. Heavy demands are made by the glass, textile and chemical industries leaving a current deficit of the order of 40,000 tons. None is obtainable in the shops.

On completion of extensions to the two plants mentioned production is scheduled to reach 1000 tons daily, 400 tons at Borek Falecki and 600 tons at Matwy, giving a total for this year of 140,000 tons planned and 170,000 tons in 1948. Home consumption is estimated at 169,000 tons and in spite of the home shortage exports last year reached 31,000 tons, mainly to Russia, Sweden and the Balkans, at an average price of $30 per ton.

Matwy, near Inowroclaw, is exceptionally well located. Electricity from the State network and surplus steam from an adjoining sugar refinery are cheap and easily accessible. The surrounding terrain has salt deposits hundreds of feet thick and large natural underground brine reservoirs. The factory employed 600 hands before the war but now 1500 are working there and the numbers will increase as completion of the extensions takes place.

U.S. Sulphur Boom

THE constantly rising demand in the U.S.A. for sulphur is shown by the fact that producers' stocks last June—3,438,367 long tons—were lower than they have been for ten years, although output had reached a record high level. These facts are contained in the summary just issued by the U.S. Bureau of Mines. Cumulative totals of sulphur produced and shipped during the first seven months of 1947 were 14 per cent and 24 per cent larger, respectively, than comparable figures a year ago.

Sulphur produced in the January-July period totalled 2,423,023 long tons (1946: 2,128,739), mine shipments represented 2,816,311 long tons (2,273,846) and "apparent sales" were 2,754,024 long tons (2,283,589).

Finance for Brazilian Rubber Industry.—The President of the Brazilian Republic has sanctioned a law recently passed by Congress providing for the financing of rubber production and the maintenance of the current price of $18 per kilo.

THE BENZOIC ACID CELL

A NEW THERMOMETRIC STANDARD

THE United States National Bureau of Standards this week announced that it has developed and made available to industrial and other laboratories a new thermometric standard utilising the freezing point of benzoic acid as a fixed temperature. Hitherto, the boiling point of water has been accepted and used as a standard, but recent investigations reveal that the freezing temperature of benzoic acid can serve the same purpose equally well. The new method results from research by Messrs. F. W. Schwab and Edward Wichers, of the National Bureau of Standards

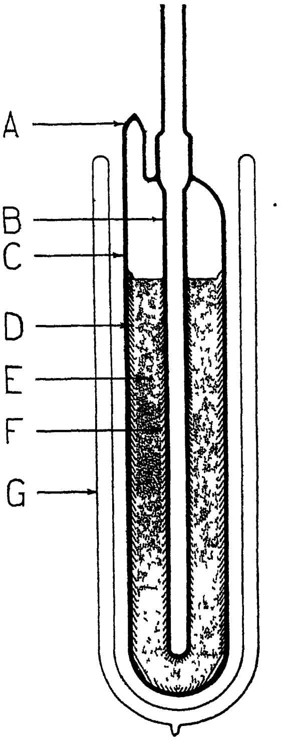


Diagram of the new benzoic acid fixed-point cell. The cell (C) is first warmed to melt the benzoic acid it contains and then cooled until a mass of fine needle-like crystals (E) appears throughout the liquid. At this point the cell is placed in the Dewar flask (G) to retard further freezing. When the instrument to be calibrated is put in the thermometer well (B), the slight loss of heat to the instrument causes a very thin layer of acid (F) to freeze on the outer wall of the well. The temperature of the thermometer is thus very nearly the temperature of the liquid-solid equilibrium for benzoic acid. As freezing gradually proceeds, a layer (D) of solid benzoic acid forms on the inner wall of the cell. The acid was initially transferred to the cell through the side tube (A), which was then sealed off.

The acid, which is specially purified for the purpose, is contained in a cylindrical chamber, about 12 in. long and 2 in. in diameter, provided with a thermometer well. This benzoic acid cell affords a means of calibrating platinum resistance thermometers and thermocouples at a temperature near 100° C. more rapidly and conveniently and, under certain conditions, more accurately than is possible with the boiling point of water. The temperature provided by the cell is virtually the triple point of benzoic acid (122.362° C.).

Drawback of Water

The boiling point of water was established as a fixed point in thermometry, not only for historical reasons but also because the thermal properties of water and its ease of purification made it an almost ideal standard substance. The laborious barometric measurements required for accurate observations of the steam point have constituted the principal drawback to the use of this temperature in thermometer calibration.

The cell is heated in an oven until the acid has melted and reached a temperature a few degrees above its freezing point. The cell is then shaken until the liquid begins to freeze, forming fine crystals. The cell is then put in a Dewar flask to retard the rate of freezing. The resistance thermometer (or thermocouple) to be calibrated is placed in the well and observations of resistance (or e.m.f.) are made for a period of one to two hours. After the first 30 minutes, the temperature of the cell is constant within 0.001°C. for an hour or longer and is reproduced in repeated "freezes" within a maximum range of 0.002°C.

Certified Accuracy

The freezing temperature of each cell issued by the Bureau of Standards is certified to an accuracy of plus-minus 0.003°C. This is an estimate of the uncertainty involved in fixing the temperature on the International Temperature Scale and does not relate to the constancy with which the temperature is maintained in a given cell during the time necessary for observations or to the day-by-day reproducibility of the cell.

Certified benzoic acid cells, it is announced, may be obtained from the Nationl Bureau of Standards, Washington 25, D.C., for a fee of $100 each. An uncalibrated companion cell containing acid of lower purity is offered for $15.00 and it is useful for practice in manipulation and for pre-warming of the Dewar flask. Cells are available with thermometer wells in three diameters, 8, 10 and 12 mm.

VEGETABLE OILS FROM ARGENTINA

MORE OIL AND FEWER SEEDS FOR EXPORT

THE people of the Argentine, in origin mainly South Europeans, have always been large consumers of vegetable oils—from 6-9 kilos per head per annum—and years ago much of it had to be imported, especially olive oil. Now, since about 1880, when the first oil-press was set up in Santa Fé, the home production of oilseeds and oils has gradually grown until, in 1939, output of vegetable oils was 100,000 tons. This was more than tripled during and since the war. By 1943 it had reached 300,000 tons, and the rate of increase of production is shown in Table I showing yields (in 1000 tons) of oilseeds and nuts from 1939-40 onwards:

TABLE I.

	Linseed	Groundnuts	Rapeseed	Cotton seed	Sunflower seed	Castor beans
1939–40	1080.4	84.4	28.8	150.0	375	6.8
1940–1	1720	61	24	93	594	7.6
1941-2	1600	82.6	4.5	155	670	5.9
1942–3	1348	96	15.6	295.3	419	4.9
1943–4	1573	198.9	12.7	231.5	1036	8.0
1944–5	786.6	158.2	19.2	134.7	985.1	7.2
1945–6	964.1	158.2	20.6	118.3	1001.6	—

The main features are heavy increases in sunflower seed and groundnuts, with some decline in linseed and cotton—doubtless, due in part at least to the fact that the former (sunflower and arachis) give a higher oil yield than cotton or linseed and the oil is edibly of a higher grade.

Argentina has long been the world's chief producer and exporter of linseed, the exports representing about half the crop, or about three-fourths of the total world exports. But with linseed, as with other oilseeds, the tendency during the war to produce the oil at home instead of exporting the seed was very marked.

TABLE II.

	Linseed	Groundnuts	Sunflower seed	Rape	Cotton seed	Total
1939	1183.2	3.7	15.5	25.3	1.6	1229.3
1945	134.6	50.9	36.1	0.8	—	222.4
		OILS				
1939	5.8	0.38	—	—	1.2	7.3
1945	46.3	3.8	71.9	10.9	19.1	151.5
		OILCAKE				
1936	—	—	—	—	—	118.4
1940	—	—	—	—	—	55.1
1945	122.1	10.86	96.2	0.98	58.53	288.7

Between 1935-39 the number of oilmills fluctuated around 35, and output varied considerably, at times involving over-production. In 1942 the number of oilmills was 64, of which more than half were devoted solely to dealing with sunflower seed. Of a total output in that year of nearly 300,000 tons, at least 230,000 tons was edible—including 175,000 tons sunflower seed oil. The oilmills are situated in Buenos Aires, the principal home market, with its three million inhabitants, in Santa Fé, Entre Rios, Cordoba, Chaco, etc.

There are also several mills in Barranqueras (cotton port of Chaco) for treating cotton seed; and at Resistencia, capital of Chaco, is a special factory, La Liguria, for producing castor oil. Many of these mills include refineries, for edible oils naturally constitute the chief product. Today they represent over 90 per cent of the total.

Before the considerable development in production of sunflower seed oil, extraction by pressing was almost exclusively the method used; but in recent years the solvent process has been increasingly employed, especially the combined system, that is to say, a preliminary pressing cold, followed by solvent extraction of the cake, and refining of the two oils after mixing and preliminary treatment. The solvent usually employed is petroleum ether of b.p. 60-90°C.

Such progress has, in fact, been made in technique that the yield of sunflower seed oil increased from 18.72 per cent in 1935 to 26.40 per cent in 1942. This oil now takes first place as the national edible oil, groundnut oil coming second; while the former principal oils—cotton and rape—have declined considerably in popular favour.

Some attention has been given in recent years to the production of tung oil (*Aleurites montana*, etc.) and the total of plants is now said to exceed two million. About 100 tons was exported in 1939.

Some olive oil also was produced before the war, i.e., 15,000 tons from about 7000 hectares, but no figures appear to be available for recent years and imports have declined almost to zero (545 tons in 1941).

With the large development of the oils

(*Continued on page* 542)

Standardised Samples

Composition and Use

BUREAU of Analysed Samples, Ltd., Middlesbrough, announces two new analytically standardised samples, *viz.*, No. 233, Permanent Magnet Alloy and No. 230 Cast Steel. The composition of these standards is given as follows:

No. 233 Permanent Magnet Alloy	%	No. 230 Cast Steel	%
		Nitrogen	0.007
Nickel	11.22	Nickel	0.143
Aluminium ...	6.98	Chromium ...	0.464
Copper	5.09	Molybdenum ...	0.173
		Copper	0.085
Provisional figures:		*Approx. figures*:	
Cobalt	23.70	Carbon	0.17
Titanium ...	0.78	Silicon	0.20
Manganese ...	0.23	Phosphorus ...	0.04
Alumina	0.025	Manganese ...	0.50

The Permanent Magnet Alloy will be useful to chemists for checking accurate determinations for Ni, Al, Cu, etc., in alloys of this type, while No. 230 Cast Steel has been prepared specially for nitrogen content and for residual metals.

Both standard samples are supplied in bottles of 25, 50, 100 and 500 g. and each bottle is accompanied by a certificate of analysis showing all the co-operating chemists' figures and the average of all. The certificate gives an outline of all the methods employed by each chemist in the analytical standardisation. Supplies may be obtained either direct from the bureau or from any of the usual laboratory suppliers.

Fire at Perfume Works

Four people were injured as the result of an explosion and fire in the laboratory of the Arthol Perfumery works in Sealand Road, Chester, last week. Several of the staff ran towards the laboratory with fire extinguishers, but were unable to enter because of the fumes. Minor injuries were caused when the windows of the laboratory were smashed from the outside in order to train the extinguishers on to the fire. Extensive damage had been done to the interior of the laboratory before the N.F.S. brought the flames under control by the use of foam.

I.C.I. Textile Plant

Imperial Chemical Industries, Ltd., has decided to erect a plant at Dumfries for the annual production of 10,000 tons of "Ardil," a wool-like textile fibre which the company's chemists have evolved from South African groundnuts after ten years of experiment and research. The plant will be erected in a factory which the company operated for the Government during the war. This announcement was made by Lord McGowan, chairman of I.C.I., Ltd., on October 7, when he unveiled a plaque to mark the inauguration of the Knockendon Reservoir, Ayrshire.

GERMAN FATTY ACIDS

Production from Lignite

A VARIANT of method for the production of fatty acids used by the Deutsche Fettsäure Werke, Witten-Ruhr, is described in F.I.A.T. Final Report, No. 326 (7d., post free) on the I.G. Farbenindustrie A.G., of Ludwigshafen. The production by I.G. at its Oppau plant of fatty acids was in most respects on the same lines as at the Witten-Ruhr factory, except that the latter worked with so-called Fischer Gatsch paraffins, while "Riebeck" paraffins were used at Oppau.

The latter were obtained from lignite pitch, TTH-paraffin resulting from high-temperature hydrogenation of lignite, as well as from synthetic paraffins obtained by the well-known Fischer-Tropsch synthesis. Output of synthetic fatty acids since 1937 amounted to 20,000 tons annually at Oppau, while Witten-Ruhr turned out double that quantity.

The end-products were mainly used in the manufacture of soap; only some five to ten tons were used in experiments connected with the manufacture of margarine. The price depended chiefly on that of the paraffins used.

During the war, Oppau produced fatty acids at 2 Rm. per kilogramme, *i.e.*, twice that of fatty acids derived from natural fats. After oxidation with air in the presence of potassium permanganate, the fatty acids were distilled into four fractions and a residue; the latter was used for the manufacture of stoving enamels, synthetic vaseline, etc.

OILS FROM ARGENTINA (*Contd. from p.* 541)

and fats industry, exports have naturally increased correspondingly. In 1939 the tonnage was only 7345, in 1945 export of vegetable oils had grown to 151,477 tons, of which more than two-thirds was of edible grade. But export of oilseeds has dropped very considerably as Table II shows (in 1000 tons):—

Concerning the future, while it is considered doubtful whether any definite views can be expressed as to the export trade, it is thought that the home demand will be maintained and augmented. Generally it is concluded that production of edible oils will maintain a level of about 110,000 tons, supplemented by import of about 10,000 tons of olive oil, when production of this latter in southern Europe and the requisite shipping are restored.

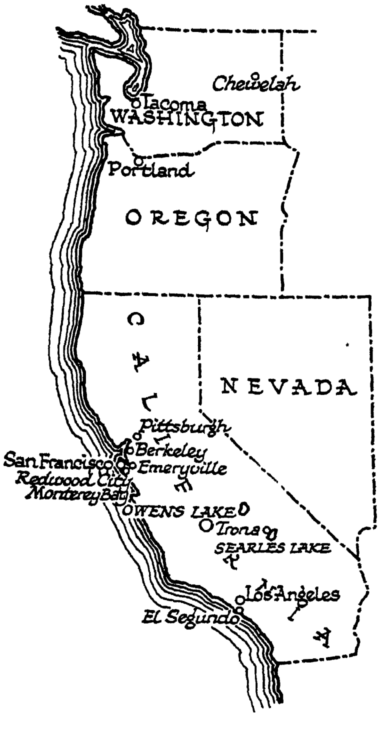
Efforts are being continued to extend cultivation of the olive in Argentina, and an Olive Culture Corporation was established by decree in October last year.

Utilising a Chemical Storehouse

America's Rich West Coast Resources

INGENUITY and effort have been necessary to take advantage of the storehouse of magnesia, borax, silicates, potash, and iodine in the Pacific Coast area of the U.S.A. An article by G. L. Allen, of the Dow Chemical Co., in the September 22 issue of the *Chemical and Engineering News* tells how this was done. According to the writer, the chemical flowsheet of the West Coast is most influenced by its largest tonnage item, common salt, production of which is almost 800,000 tons per year. Most of it comes from the San Francisco Bay and the solar evaporation ponds of the Leslie Salt Co. An unusual set of physical conditions, including 25,000 acres of impervious stiff clay soil and ample wind and sun, makes possible an evaporation rate of 30 in. per year over and above rainfall of 15 in., most of which occurs within four winter months. After mechanical harvesting, part of the salt is refined for human consumption, while the bulk is shipped by rail or water transportation to industrial users.

Solar salt is also produced on the Monterey Bay and by the Western Salt Co. at Chula Vista, San Diego County. Additional salt comes from excellent rock salt deposits and desert lake beds of California and Nevada.



After the recovery of salt from evaporated sea water by the Leslie Salt Co., the raw bittern, with its thirtyfold increase in magnesium ion, is transferred by pipe line to the plant of the Westvaco Chlorine Products Corp., the largest tonnage producer of commercial magnesia from brine. Here, high-quality lime from a large supply of oyster shells on the floor of the San Francisco Bay is reacted with the brine as follows:—

$$MgSO_4 + CaCl_2 = MgCl_2 + CaSO_4.2H_2O$$
$$MgCl_2 + CaO = CaCl_2 + Mg(OH)_2$$

The precipitation is carried out with powdered lime under carefully-controlled conditions to form a granular, easy-settling sludge, in this respect differing greatly from magnesium hydroxide precipitated by a soluble alkali or by milk of lime.

After washing with fresh water in Door thickeners, the hydrate slurry is calcined to various grades of magnesia. The gypsum is filtered off and converted by drying to a high-purity product which finds a considerable market in breweries.

Among the different grades of magnesia produced by Westvaco are the following: active, chemical, insulation, hard-burned, oxychloride, and periclase. Since each of these materials requires a separate set of calcining conditions, a number of kilns with accurate temperature control are necessary.

Immense Magnesite Deposits

The largest production of magnesia in the United States comes from magnesite ore bodies, which exist in workable deposits in only a few places, practically all of which are on the West Coast. Westvaco calcines magnesite from various deposits, while the heaviest tonnage producer of magnesia continues to be the Northwest Magnesite Co. at Chewelah, Wash., where an immense deposit of medium-quality magnesite is recovered by quarrying.

Perhaps the most unusual of all sea water operations is the powdered magnesia operation of the Marine Magnesium Products Corporation, at South San Francisco, Calif. Organised in 1927 by R. E. Clarke, the company pioneered the recovery of magnesia from raw sea water, the difficulties of which were legion. Having purchased what appeared to be a simple process, they were immediately confronted by a myriad of variables. Not only was the sea water of uncertain concentration, in wet years becoming heavily diluted with rain water, but calcium bicarbonate, silica, and iron all were precipitated with a magnesium hydroxide that would neither settle, filter, nor wash. These many difficulties were finally overcome and the organisation began to show profits in 1936.

To produce a milk of magnesia, it is first necessary to remove the bicarbonate ion with lime, chlorinate, and clarify the brine, so that it is free from the silica, carbonate, iron, and organic matter. Lime slurry of special purity and quality then precipitates the hydroxide, which is settled and washed. As USP milk of magnesia, it is then either bottled or further concentrated to 30 per cent "hydro magma" paste for shipping purposes. As raw material for other processes, the 10 per cent milk of magnesia slurry is either dried to hydroxide powder and heavy USP grade magnesium oxide or carbonated, filtered, and dried as basic magnesium carbonate, which can be calcined to light USP magnesium oxide.

Magnesia Plants

The 85 per cent magnesia insulation industry, which utilises magnesia from the San Francisco Bay plants, has been developed by the Johns-Manville Corporation at Redwood City, and the Plant Rubber and Asbestos Works Division of the Paraffine Cos., Inc., at Emeryville. The latter corporation uses a novel process developed in its own western laboratories wherein the self-setting properties of magnesium carbonate are utilised. This approach, as opposed to the filter press method used elsewhere, makes possible close density control and production of a lightweight product.

Another great storehouse of chemicals on the coast is contained in the alkaline salt deposits of the southern part of California, where, despite immense reserves, untiring effort and ingenuity have been exacted of producers. Among the many obstacles confronting the operator are: the complex phase-rule systems, varying salt concentrations from winter to summer, presence of organic matter and silica, as well as a short labour supply and a dearth of fresh water.

The largest operator, the American Potash & Chemical Corporation at Trona, on Searles Lake, is California's only potash producer and has an output of over 200,000 tons per year. It recovers 30 per cent of the world's borax, which will soon be expanded by 30 per cent to 130,000 tons per year; 86,000 tons per year of soda ash, soon to be increased to 146,000 tons; and 140,000 tons per year of salt-cake, which is the largest single output of this chemical in the United States and is sold principally to the kraft paper mills of the North-West.

The basic separation process starts with evaporation and settling to bring down salt crystals and then fine crystals of burkeite ($Na_2CO_3.2Na_2SO_4$), followed by cooling of the clear liquor to crystallise potassium chloride and then borax, which conveniently supercools and remains in solution until the potassium chloride is removed.

Although the plant is now drawing on the upper deposit, containing several hundred million tons of brine, a lower deposit beneath the mud lake bed and of equal size will be utilised in the soda ash and borax expansion. The plans call for the carbonation process, which precipitates sodium bicarbonate, followed by calcination to soda ash. The latter is purified by recrystallisation to the monohydrate, subsequently calcined with an oxidising agent for colour improvement.

Other products at Trona are: crude lithium phosphate, potassium sulphate and potassium bromide, anhydrous sodium sulphate, anhydrous borax, boric acid, and bromine, which is produced during the purification of potash.

Immediately south of Trona is the West End Chemical Co., the world's largest producer of natural soda ash. This company uses the carbonation process, the carbon dioxide for which is obtained by calcining limestone. Borax is crystallised from the mother liquor, but the other compounds are returned to the lake.

The world's largest production of borax now comes from Boron, Calif., where the Pacific Coast Borax Co. mines kernite, which is later refined at Wilmington. The principal markets for California's borax are east of the Mississippi and are mainly glass, enamel, and detergents.

Owens Lake Brine

On Owens Lake several companies are carbonating the rich soda brine to precipitate either trona or bicarbonate, depending on the soda ash concentration, which varies with rainfall but often reaches 15 per cent. These smaller plants are owned by the Wyandotte Chemicals Corporation, the Pittsburgh Plate Glass Co., and the Permanente Metals Corporation. The latter's 100-ton plant was recently erected in record time to supply alkali for the Kaiser Baton Rouge demands.

As would be expected, the West's soda ash is mainly consumed on the coast in glass, pulp and paper, soap, detergents, alumina, and chemicals, for which the overall demand has created a shortage in the neighbourhood of 20,000 tons per month. This pressure is causing a rapid expansion of the natural soda industry, which is critically examining all natural deposits and has started major operations in at least one new location, Green River, Wyoming.

The coast has five major electrolytic plants for the manufacture of caustic soda and chlorine: the Pennsylvania Salt Manufacturing Co. at Tacoma and Portland, the Hooker Electrochemical Co. at Tacoma, the Dow Chemical Co. at Pittsburgh, Calif., and the Stauffer Chemical Co. at Henderson, Nev., where the Hooker cell installation of the basic magnesium plant is being leased.

Present production is over 150,000 tons per year of chlorine, most of which is used by the pulp industry, with sanitation and organic chemicals next. Dow produces also caustic potash, largely used as a captive product in xanthate manufacture.

The Western Electrochemical Co. at Henderson, Nev., and the Pennsylvania Salt Manufacturing Co. at Portland produce potassium chlorate and sodium chlorate by electrolysis of salt.

The only phosphate plant on the West Coast is that of the A. R. Maas Chemical Co. at South Gate, near Los Angeles, where phosphorus is burned to phosphoric acid to be converted into the different phosphates. This company also burns sulphur for the manufacture of sodium sulphite and thiosulphate and refines other chemicals for the photographic trade. Production of these chemicals is being expanded to meet the increased demand of the West.

The silicate demand is amply met by the Philadelphia Quartz Co. of California, which operates plants at South Gate and Berkeley, Calif., and Tacoma, Wash. The Emeryville Chemical Co., now owned by the Standard Silicate Division of the Diamond Alkali Co., is also operating in Emeryville on the San Francisco Bay.

Sulphuric Acid Production

Sulphuric acid production is well distributed on the coast. The Los Angeles area is served by the Stauffer Chemical Co. plants at Torrance, Dominguez, and Vernon, and the General Chemical Co. at El Segundo. The San Francisco Bay area has two General Chemical Co. plants, one at Richmond and another at Nicolaus, a Stauffer plant at Richmond, and the American Smelting & Refining Co. at Selby. The sole producer in the North-west is Du Pont in Washington, where it has captive use in the nitric acid plant at the same location. Because of availability, iron pyrites and smelter gases have become increasingly important raw materials for sulphuric acid production. Rail shipments of sulphur, however, are still the largest factor. Stauffer uses considerable acid in its own superphosphate, alum, and boric acid plants, while the General Chemical Co. has captive uses in making alum and hydrofluoric acid.

An unusual outlet for sulphuric acid is the reclaiming of "black alkali" soils of California. This use is being given great impetus by the high farm prices now prevailing.

Hydrochloric acid, a product of organic chlorination, is produced by the Dow Chemical Co. at Pittsburg, Calif., and has minor captive uses in ammonium chloride and aluminium chloride. Solution of aluminium chloride is also produced in Southern California by the Stauffer and General Chemical Cos.

The Barium Products Co. at Modesto, Calif., a subsidiary of Westvaco, produces barium sulphide, hydroxide, carbonate, oxide, and peroxide, as well as hydrogen peroxide and sodium sulphide, for use in ceramics, paints, paper, pyrotechnics, cosmetics, etc.

The entire United States production of elemental iodine comes from the Southern California plants of the Dow Chemical Co. at Seal Beach, Venice, and Inglewood, and the Deepwater Chemical, Ltd., at Compton. Practically all of this material is shipped east. Liquid sulphur dioxide is made by Dow at Pittsburgh and Eston Chemicals, Inc., in Los Angeles. Eston produces also potassium metabisulphite and sodium bisulphate.

As an exporter to other sections of the United States, the West Coast is prominent in magnesias, borax, silicates, potash, and iodine. Raw material deficiencies are notably the elements phosphorus and sulphur, although the latter is supplemented by smelter gases and iron pyrites. Basic chemical requirements such as sulphuric and hydrochloric acids, the alkalis, saltcake, phosphates, and halogens have been met by local producers with occasional temporary deficiencies.

British Instruments "Less Reliable"

THE view that British instruments for control in oil refineries lagged seriously behind their American counterparts was expressed at a joint meeting in Edinburgh last week of the Society of Instrument Technology and the Institute of Petroleum. The speaker, Mr. D. J. Pull, asserted that in the war a considerable number of instruments of British design and manufacture were installed in oil refineries in this country, and although eventually good control was achieved, the system was never sufficiently stable, and from a maintenance angle these instruments were far less reliable than their American designed counterparts. Considerable prejudice was experienced on the part of operators before the British-designed instruments were allowed to take over control, and it was to be regretted that the experience gained with them did nothing to eliminate that prejudice. No good could come of concealing the facts, he said.

Rubbers in U.S. and Canada

Synthetic and Natural

No increase in the natural rubber content of their products is expected by Canadian rubber manufacturers in the near future, a company official has declared. Commenting on a Washington announcement last week-end that U.S. manufacturers would no longer be required to use synthetic rubber in approximately 30,000 items, he said the change places the American industry on the same footing as it has been in Canada for the last year, leaving it up to manufacturers to determine allocation of their crude and synthetic supplies.

By voluntary agreement Canadian manufacturers use a proportion of synthetic rubber in their products, although regulations requiring its use were revoked by the Rt. Hon. C. D. Howe, Minister of Reconstruction, last autumn. The official said a balance between natural and synthetic rubber would be reached as more supplies became available. Synthetic rubber has proved more suitable than the natural product in some cases, he said, while natural rubber was used even in wartime in other products where it could not be replaced. The official pointed out that use of synthetic rubber was still required in tyres and tubes in the United States. These accounted for 75 per cent of rubber supplies.

Obituary

Lt.-Col. Ernest Briggs, who was chairman of Lever Bros., Port Sunlight, Ltd., up to January this year, died at Colchester on October 12, aged 66.

Dr. Stephen Miall, editor of *Chemistry and Industry* and the *Journal of the Society of Chemical Industry* from 1923 to 1945, died on October 12 at the age of 75. The author of a number of books including "The History of the British Chemical Industry," "Chemistry, Matter and Life," and an anthology—"Poets and Play" (the first two being written in collaboration with his son, Mr. L. N. Miall) Dr. Miall enjoyed a reputation in the chemical industry that few can equal.

Mr. Gavin Cowper, London manager of Messrs. Colvilles, Ltd., died in Glasgow on October 9, aged 65 years. He was born in Motherwell and was associated with the sales department of the firm for many years. During the last war he served with the Iron and Steel Control Department of the Ministry of Supply. Mr. Cowper was trained at the Dalzell works of Messrs. Colvilles, and was at the head office in Glasgow before going to London. He had been ill for some time, and collapsed when travelling to Scotland for a holiday.

Exploiting Methane Gas

Initial Developments in Transylvania

The natural gas resources in Transylvania constitute the most important supplies of hydrocarbon gases in Europe claims M. Constantinesco, in *Les Cahiers France-Roumanie*. The total available is computed at 500,000 to 600,000 million cu. m., and consists mainly of methane (90-99 per cent). To date, some 160 shafts or outlets have been drilled, of which about 79 are in operation. These employ 370,000 metres of conveyor pipe, with a daily capacity of about 10 million cu. m.

Operation is entirely in the hands of the Soc. Nat. du Gaz Methane, in which the Government holds 80 per cent of the share capital of 8500 million lei. Annual consumption is in the region of 600 million cu. m., and is expected shortly to reach 1500 million, representing less than half of one per cent of total reserves so far discovered.

The principal use of the natural gas by the Rumanian chemical industry is in the manufacture of lamp black and formaldehyde in the Medias and Copsa Mica works. Two other companies are employing it for production of hydrogen in the manufacture of synthetic ammonia and derivatives. Entreprises de Ucea, a state concern, is building a new factory for manufacture of ammonia, etc. Other uses are as fuel. It is thought that fertiliser production could be increased by better use of this gas.

Canadian Chemical Industry

Employment Statistics

Employment in the chemicals and allied products manufacturing industries of Canada at July 1, 1947, was recorded at the same mark of 95 as at June 1, 1946. This was still higher than the 92 mark of July 1, 1946, with June 1, 1941, being equal to 100, according to the Department of Trade and Commerce.

Weekly pay rolls amounted to $1,648,634 for the reporting firms in the industry. The average weekly earnings in this industry at July 1, 1947, June 1, 1947, and July 1, 1946, were registered at $39.09, $38.78 and $35.03 respectively. The aggregate pay rolls stood at 137.8, 136.7 and 120 at July 1, 1947, June 1, 1947, and July 1, 1946, respectively, with June 1, 1941, being equal to 100.

The proportion of men employed in this industry had increased only slightly at July 1, 1947, being 74.1 per cent as against 74 per cent at June 1, 1947, though much higher than the 71.6 per cent recorded at July 1, 1946, with women being engaged in this work in the percentages of 25.9, 26 and 28.4 at July 1, 1947, June 1, 1947, and July 1, 1946, respectively.

NEXT WEEK'S EVENTS

SATURDAY, OCTOBER 18

North of England Institute of Mining and Mechanical Engineers. Lecture Theatre of the Institute, Newcastle-upon-Tyne, 2.30 p.m. General Meeting. B. J. Taylor and J. Hancock: "Shot-firing and Explosives in Coal Mines"; Dr. William Hopkins and Mr. George Hindson: "The Relationship of the 'Wash' between Shincliffe Bridge and Harbour House Park, County Durham."

MONDAY, OCTOBER 20

Society of Chemical Industry (Yorkshire Section, Chemical Engineering Group, Hull Chemical & Engineering Society, and Leeds University Chemical Engineering Society). Chemistry Lecture Theatre, The University, Leeds, 7 p.m. H. C. Millett: "Some Experiences in the Heavy Chemical Industry."

Royal Institute of Chemistry (London and S.E. Counties Section). Lecture Hall, Public Library, Luton, 7.30 p.m. Films and discussion on Water Treatment.

TUESDAY, OCTOBER 21

Institution of Rubber Industry. Caxton Hall, Caxton Street, S.W.1, 7 p.m. Dr. G. F. Bloomfield: "Vulcanisation."

Society of Chemical Industry (Agriculture Group). Chemistry Department, Royal College of Science, Imperial Institute Road, S.W.7, 2.30 p.m. G. A. Cowie: "Fertiliser Requirements of Wheat as Determined by Field Trials."

WEDNESDAY, OCTOBER 22

Society of Chemical Industry (London Section). Royal Institution, Albemarle Street, W.1, 6.30 p.m. Sir Frederick Keeble: "Some Aspects of the Work of H. E. Armstrong." (2nd H. E. Armstrong Memorial Lecture).

Royal Institute of Chemistry (Newcastle-on-Tyne and N.E. Coast Section). Chemistry Lecture Theatre, King's College, Newcastle-on-Tyne, 6.30 p.m. G. R. Clemo: "The Organic Chemist and Some Isotopes."

THURSDAY, OCTOBER 23

Society of Chemical Industry, Chemical Society and Royal Institute of Chemistry (Bristol and S.W. Counties' Sections). Chemical Department, The University, Bristol, 5.30 p.m. A. S. Nickelson: "Physico-Chemical Methods—with special reference to Spectroscopy and Polarography."

Society of Dyers and Colourists (West Riding Section). Great Northern Victoria Hotel, Bradford, 7.15 p.m. Dr. G. Bennett Oliver: "Occupational Diseases."

The Chemical Society. Burlington House, Piccadilly, W.1, 7.30 p.m. Professor E. G. Cox: "Crystallographic Technique and its Chemical Significance" (Tilden Lecture).

The Textile Institute (Irish Section). Belfast College of Technology, Belfast, 7.30 p.m. Representative of Flax Spinners' Association: "Management."

The Textile Institute (Lancashire Section). The Textile Institute, Manchester, 6.30 p.m. Dr. E. Lord: "Some Practical Aspects of Sampling with Special Reference to the Cotton Industry."

The Chemical Society (Hull Section). University College, Hull, 6 p.m. Professor D. H. Hey: "Addition Polymerisation."

International Society of Leather Trades Chemists (British Section—Northampton Group). College of Technology, Northampton, 2.30 p.m. Dr. W. Siddall: "Some Modern Methods of Chemical Analysis."

FRIDAY, OCTOBER 24

Society of Chemical Industry (Food Group). Joint Meeting with the East Anglian Section of the Royal Institute of Chemistry. Norwich City College, Norwich, 7.30 p.m. Discussion on "The Herring and its Preservation."

ELECTRIC WELDING PROCESS

An electrical process for the melting of glass, which although used on the Continent, has not so far been seen in this country, was discussed in Liverpool on October 6 by Mr. P. C. Barnes, resident electrical engineer at Pilkington Bros., St. Helens. He suggested that the cost of electricity in this country was a bar to the use of the process here at present. Mr. Barnes, who was making his first address after being installed as chairman of the Mersey and North Wales Centre of the Institution of Electrical Engineers, said a good producer gas-fed tank could produce a ton of glass with every half a ton of coal although this figure was not so easily attainable with the present inferior coals. If the price of 2000 kWh were not to exceed the price of one ton of coal, there would, he said, be a case for electric melting.

Chemical Glassware Manufacture

According to a statement by Sir Graham Cunningham, chairman and managing director of the Triplex Safety Glass Co., Ltd., Quickfit & Quartz, Ltd.—a subsidiary of the company—has increased its output of laboratory glassware by about 50 per cent during the last twelve months. This has been made possible by the acquisition of a factory at Stone, Staffordshire. Factory alterations and the training of local staff have since been undertaken although the changeover is not yet completed.

Technical Publications

Report on D.S.I.R. Wartime Foam Research

Among the many advances in technology brought about by wartime needs, the development of fire-fighting equipment, and especially of foams, received as great an impetus as any. The whole field of fire-quelling foam is studied in detail in the latest published report of the Chemical Research Laboratory of the Department of Scientific and Industrial Research, "A Study of Mechanically-Produced Foam for Combating Petrol Fires" (H.M.S.O., 2s. 6d. net.) This gives in full the results of several years' research at the laboratory with specialised equipment in close liaison with the Fire Division of the Ministry of Home Security and represents the only authoritative review available of the performances of the most favoured materials, such as blood-saponin compounds, keratin and various blood and chemical compounds. The report is furnished with ample illustrations of the actual foams, performance graphs, diagrams and other data.

* * *

"The Story of Rubber," the latest addition to the Commodity Series of books written by experts to provide comprehensive studies in a popular form of industrial achievements, is by Dr. Richard J. Tudor, who has distinguished himself in the synthetic rubber field and is a member of the council of the Institute of the Rubber Industry. This volume, which the Burke Publishing Co., Ltd., offer at 7s. 6d., has a stimulating introduction by Prof. A. M. Low and, like its four predecessors, presents its subject in is most interesting form with a wealth of excellent photographs.

* * *

The first major post-war publication by Griffin & Tatlock, Ltd., is at first sight an impressive departure from the austere garb of most current technical literature. "A Catalogue of Modern Scientific Apparatus," with its 616 illustrated pages in imposing volume form, represents, however, the most economical and certainly the most convenient form in which to present the several hundred items of apparatus for physics, chemistry and biology and chemicals and reagents which the company lists for educational and general laboratory work. The vast catalogue reflects a very creditable achievement in making good the interruption of supplies caused by concentration throughout the war of supplies for war industries and the Services.

* * *

The widespread contributions made to the chemical food, marine engineering and other industries by the products of Peter Brotherhood, Ltd., the Peterborough engineers, are well illustrated by the booklet now being distributed in which is depicted a representative range of compressors and power plant designed for many vital processes. Of special contemporary interest are the air and gas compressors which are playing an increasingly important part in chemical industry. An interesting contrast is provided by pictures of a Brotherhood three-stage high-pressure air compressor, dated 1877, and a group of vast high-pressure gas compressors with which the firm recently equipped a large chemical factory.

* * *

The increasingly close study of metallurgy in many aspects is likely to be the prerequisite of most future advances in welding technique. This fact is fully recognised and emphasised in the annual report, 1946-7, of the British Welding Research Association, which contains many useful summaries of the progress made in specialised studies of ferrous and non-ferrous metals, the former predominating, and of research work now in progress.

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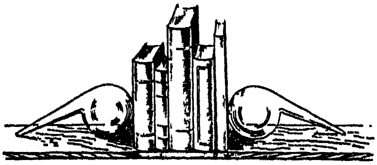
All who have affiliations with the Continental chemical industry will welcome the reappearance of the annual publication by the Fédération des Industries Chimiques de Belgique of the 1947 review of Belgian chemical manufacturers and manufactures arranged in convenient form for ready reference and the brief summaries of the lines along which specialised sections have developed in the six years since the last annual review was available. Among the many points of interest raised in the course of these specialised reviews is the recognition in the section devoted to explosives of the increasing number of industrial formulations which are now based on ammonium nitrate.

* * *

The practice of using concentrates in neat cutting oils and additives in lubricating oils has been widely adopted in the U.S.A. in recent years. A range of these products is available here and is described in a booklet, "The New Cutting Oil Concentrates and Additives for Lubricating Oils," just published by the manufacturers, Petroleum Inventions, Ltd. (a member of the Manchester Oil Refinery group of companies), of Twining Road, Trafford Park, Manchester. It is claimed that these products eliminate many disadvantages attached to the former use of fatty oils, *e.g.*, gummy effects, liability to develop rancidity, tendency to become bacteria-infected, etc. The concentrates are particularly suitable for precision engineering operations.



A CHEMIST'S BOOKSHELF

Survey of Antimalarial Drugs. Washington. Office of Technical Services, U.S.A. Department of Commerce, Washington, D.C. $102 (photostat) and $56 (microfilm) and J. W. Edwards, Ann Arbor, Michigan, $30 (bound volumes).

The scientific achievements of America's co-ordinated wartime research into antimalarial drugs are described and tabulated in a comprehensive three-volume survey of antimalarial drugs just released by the Office of Technical Services of the U.S. Department of Commerce. Edited by Frederick Y. Wiselogle, professor of chemistry at John Hopkins University, the survey, carried out between 1941 and 1945 by hundreds of universities, pharmaceutical firms and government and private laboratories, was prepared to "expedite research for still better antimalarial drugs, and to establish a pattern for systematic chemotherapeutic studies of other infections." The objective of the programme, according to the survey, was to control malaria by chemotherapy or chemoprophylaxis in four ways: (1) determination of the optimal methods of using known antimalarial drugs in suppressive treatment and therapy; (2) discovery of drugs which act as true causal prophylactics in the human malarias and which can be given to man with safety over extended periods of time; (3) discovery of drugs which will consistently eradicate the parasites in human infections and thus prevent relapses which commonly occur after "clinical cure" with quinine or quinacrine; and (4) discovery of drugs which have antimalarial properties qualitatively similar to quinine or quinacrine but which possess a larger margin between the effective and toxic doses. In the course of the research over 12,000 compounds were examined. Volume II of the survey, in two volumes, is a record in tabular form of the identities, antimalarial activities and, in many cases, the toxicities of 12,400 chemical substances examined in the research programme. The drugs are grouped into six sections: (1) compounds of known structures; (2) inadequately characterised compounds or mixtures; (3) plant and animal products of known genus; (4) inadequately identified plant and animal products; (5) proprietary products, and (6) nondescript remedies. All data appearing in the survey have been checked against original sources, and all calculations have been verified, according to the editor.

Statistical Methods in Research and Production with Special Reference to the Chemical Industry. Edited by Owen L. Davies. Published for Imperial Chemical Industries, Limited, by Oliver and Boyd, London and Edinburgh, 1947. Pp. XI + 292. 28s.

As its foreword announces, the book is the first of a series of scientific and technical handbooks which Imperial Chemical Industries, Limited, intends to publish with the aim of making generally available the important information accumulated as a result of the company's manufacturing experience and research.

The seven authors all actually engaged on research and process work, who have co-operated in compiling this handbook, have obviously been allowed to draw freely on all the information in the company's possession, so that every example represents a genuine problem encountered in actual practice.

In the course of ten chapters, attention is paid to the most important statistical unit methods likely to be of use in the chemical industry together with the types of problems to which they may be applied. Although the planning of the respective experiments is not included in the present handbook, it is intended that it should form the subject-matter of a second volume, to be issued later.

After a comprehensive exposition of general statistical theories and terminology a number of practical exercises are set out in detail together with numerous charts, figures and tables. A glossary of statistical terms, mathematical expressions and symbols characterises the main object of this handbook, *i.e.*, to bring together under one cover those statistical methods used in the chemical industry. Industrial chemists and students of statistics will find this book an invaluable addition to their library.

Penicillin Production in Japan

Production of penicillin in Japan is in the hands of 72 concerns, of which 19 are already marketing the product. During the period July, 1946, to August, 1947, 1,543,110,000 units were prepared. It is planned to produce one hundred thousand million units, though it has not been possible to set a time limit for reaching this target.

Home News Items

Brewers' Exhibition.—The first post-war Brewers' Exhibition is to be held at Olympia from October 27 to November 1.

Auction Sale.—Electrical and engineering plant and equipment, the property of the Ministry of Supply, Depôt 55, Junction Road, Weston-Super-Mare, Somerset, will be sold by auction at that address from October 22-24.

New Agents for Swedish Match Co.—Messrs. Lazard Brothers & Co. have been appointed fiscal agents in Britain to the Swedish Match Co. in succession to Messrs. Higginson & Co.

Thames Haven/Shell Deal.—Thames Haven Oil Wharves Limited announces that it has concluded an agreement with the Shell Refining and Marketing Co. for the sale of about 700 acres of land at Thames Haven. It is understood that Shell is considering the erection of an oil refinery on the site.

University Studies of Seaweed.—The Scottish Seaweed Research Association announces that research in collaboration with the Association's staff into the potentialities of seaweed as a fertiliser and for other uses is in progress at the universities of Edinburgh, Glasgow, Liverpool, Manchester, London, Nottingham and Reading. Important developments in the uses of seaweed-derived substances are anticipated.

Coal Production Up.—A useful increase in colliery output the first on such a scale for some weeks is shown in the current weekly summary issued by the Ministry of Fuel. The provisional total output for the week ended October 11 was 4,017,100 tons, which compares with 3,863,800 in the week ended October 5 a year ago. Last week's total comprised 3.750,900 tons of mined coal and 266,200 tons from open-cast production. Returns for the week ended October 4 show the output per manshift remained at the better figure of 2.90 tons (2.79 in 1946), but the labour force was reduced by about 500.

Glaxo's Penicillin Factory.—Reports that the Glaxo Laboratories penicillin plant at Barnard Castle are to be removed to Lancaster, the possibility of which was mentioned at the time of the recent Ministry of Health inquiry into the refusal of the local authority to accept the factory's effluent, has been denied by a director of the company. It is hoped now that arrangements may soon be made for disposal of the penicillin effluent through the sewerage system. Subject to a satisfactory outcome of the official inquiry, it is understood that interruption of the work at Barnard Castle is unlikely.

Dust and Smoke Meter.—The "Electrotor" dust and smoke meter, formerly obtainable from Leeds, is now supplied by Dr. S. C. Blacktin at 21 Albert Street, Shildon, Co. Durham.

Change of Address.—Metronic Instrument Co. announces that it has now moved to 29 Rae Street, Birmingham, 5 (Tel.: Mid 2300), to which all correspondence should now be addressed.

U.K. Tin Position—August.—Stocks of tin metal held by the Ministry of Supply and consumers at August 1, amounted to 9222 long tons. Consumption for the month was 1674 long tons, and production 2370 tons.

No Overtime.—An appeal for reinstatement in employment at Steel's Crown Works, a Sunderland foundry, by a workman who had been dismissed after refusing to work overtime has been dismissed by the local Reinstatement Committee.

New I.C.I. Project.—The Wilmslow (Cheshire) Urban District Council has approved proposals by I.C.I. (Pharmaceuticals), Ltd., to erect research laboratories and administrative headquarters on a 160-acre site near Hough. It is understood that in the initial stages the project will provide employment for about 300 persons.

New Chemical Factory.—A new factory is to be erected at Blandfield Chemical works, Wheatfield Road, Edinburgh. It is to be a 3-storey building, and will be used for the manufacture of fine chemicals and alkaloids for the home and export markets. Accommodation is to be provided for research facilities.

Sulphuric Acid Lorry Crash.—After a collision with a car, on October 8, a six-wheeled I.C.I. (Widnes) tanker carrying eight tons of sulphuric acid mounted the footpath in Arpley Street, Warrington, and smashed into the District Nurses' Home. No one was injured, but a woman cleaner had a remarkable escape. The acid load on the lorry remained intact.

Gas Industry Neglected.—"The entire lack of coordination between supply departments and the Ministry of Fuel to ensure that raw materials were available for their industry" was deplored by Mr. J. G. Aitken in his presidential address to the North of England Gas Managers' Association at Carlisle last week. Millions, he noted, were being spent on the erection of generating stations. It was the Government's duty to state now its policy towards the development of the gas industry.

PERSONAL

Mr. W. Beswick has resigned from the board of Brown Bayley's Steel Works, Ltd.

Mr. C. F. Gilbertson has resigned from the board of Richard Thomas & Baldwins, Ltd.

Mr. P. A. Nasmyth, recipient of the Allen and Hanbury's Research Fellowship for post-graduate study, has had his award renewed this year.

Mr. G. C. Pearce and Mr. C. Waite have been appointed joint managing directors of Consolidated Tin Smelters, Ltd., in succession to Mr. E. V. Pearce with effect from October 31. Mr. E. V. Pearce remains the company's chairman.

Mr. L. H. Cooper, a director of the Mond Nickel Company, has been elected assistant secretary and assistant treasurer of the International Nickel Company. The appointment in no way affects his position in the Mond Nickel Company.

Dr. Norman C. Wright has been appointed chief scientific adviser to the Ministry of Food in succession to Sir Jack Drummond, F.R.S. Dr. Wright is being seconded from the Hannah Dairy Research Institute for the duration of his appointment.

Mr. M. J. Gartside has been appointed chairman of the Rheostatic Company in succession to Mr. L. Satchwell, who has retired. Other appointments consequent upon Mr. Satchwell's retirement are: Mr. T. N. Flight, vice-chairman and managing director, and Mr. J. H. Stevens, deputy managing director.

Mr. Harry L. Riley, a former Professor of Inorganic Chemistry at King's College, Durham, who has been serving as director of carbonisation research for the National Coal Board, has accepted appointment as senior director of research of the United Steel Corporation. He left Southampton last week-end en route for the U.S.A., where he is to address the American Chemical Society at Pittsburgh.

Mr. George W. Merck, president of Merck & Company, Rahway, New Jersey, who directed the United States' extensive research on biological warfare during World War II, has been awarded the Chemical Industry Medal for 1947, announces Mr. C. S. Kimball, of Foster D. Snell, Inc., New York, chairman of the American Section of the Society of Chemical Industry. The medal will be presented to Mr. Merck at a dinner on November 7. Last year, Mr. Merck received the Medal of Merit for his contribution to the war effort in guiding the biological warfare development programme.

Sir John Green, a director of metal Industries, Ltd., who is due to retire this year by rotation, is not to seek re-election.

Mr. John E. Bailey, an assistant physicist of the Widnes laboratory of I.C.I., and since February, 1946, a Widnes town councillor, has resigned his seat on the council.

Mr. William Maitland Thomson, Station Road, Thornton Cleveleys, retired area manager, Leyland Rubber Works, left £15,475, net £15,333.

Mr. W. Fox, a principal of the Ministry of Supply (metals Division) has been appointed secretary of the management committee of the International Tin Study Group.

Mr. John Lionel Barber, of Neston, Cheshire, South American Merchant, chairman of Lampa Mining Co., Ltd., and Limbani Syndicate, Ltd., managing director of Lionel Barber, Sons, & Co., Ltd., left £14,829, net £12,955.

Officers for the next session of the Chemical Society of the University of Birmingham have been appointed as follows: Sir Norman Haworth, F.R.S. (president), Mr. M. A. G. Kaye (secretary), and Mr. C. T Greenwood (treasurer).

Dr. Geoffrey Gee, director of research at the British Rubber Producers' Research Association Laboratories, led the British delegation to the international meeting of rubber research workers held at Delft, Holland, this week.

Miss Nancy Morrow, an engineering librarian at the University of Liverpool, is to marry Mr. John Selwyn Morley, an Associate of the Royal Institute of Chemistry. He is a graduate of the University College of Durham, and joined the staff of Liverpool School of Tropical Medicine in 1946, as research worker.

Mr. R. H. Marks, formerly an R.A.F. Squadron-Leader, and latterly a director of an export company in London, has been appointed assistant secretary of the Federation of British Industries' North Western Regional Office at Manchester, in succession to Mr. W. R. Eadie, now secretary of the South-Western Region of the F.B.I., at Bristol. After leaving Worthing High School, Mr. Marks spent two years in an accountant's and auditor's office before joining the R.A.F. in 1937.

D.S.I.R. Appointments

Prof. P. T. Dee, F.R.S. (Professor of Natural Philosophy at Glasgow University), and Sir William Griffiths (chairman and managing director of the Mond Nickel Co., Ltd.) have been appointed members of the Advisory Council of the Department of Scientific and Industrial Research.

Overseas News Items

Russian Arsenic for U.S.A.—The recent arrival of about 100 tons of Russian arsenic is expected to relieve the shortage in the U.S.A. of this important insecticide.

Price Control in France Ended.—The French economic authorities have abolished price control on a number of chemical products, including copper and tin phosphide, potash and ammonia persulphates and distilled water.

Uranium Find in E. Africa.—Uranium and thorium deposits are reported to have been discovered in the Tete district of Portuguese East Africa by a prospector who had been searching for samarskite. British, U.S., Belgian and Dutch geologists are said to have visited the deposits.

French Hydrogen Peroxide Production.—It is reported that two leading French chemical groups, viz., Ugine and the Air Liquide have increased their hydrogen peroxide production to 2000 tons p.a., and that Germany's former markets for this important product have been completely captured.

Aluminium Research Laboratory.—The Permanent Metals Corporation, Oakland, California, has announced the establishment of a technical laboratory described as the largest of its kind to be devoted exclusively to aluminium research. There are several sub-divisions each concentrating on a particular phase of the aluminium industry, such as physical testing, finishes, fusion joining and corrosion.

BETRO and the Dollar Crisis.—Nearly 100 important U.S. trade inquiries have been received at BETRO in London since its Washington office announced a new service to U.S. importers a fortnight ago. The new head of BETRO in the U.S. is Mr. Warren S. Lockwood, at one time Commercial Attaché to the U.S. Embassy in London, but now responsible for the measures being taken to bring substantial orders to British manufacturers.

German Chemical Output.—From the American zone of Germany come reports that output has reached about one-half of the pre-war volume in recent months. This is stated to be an increase of about six per cent over the figures for the second half of 1946. Output of several basic products is reported to have reached 40 per cent of the 1936 level, *i.e.*. the limit fixed under the Allies' 1944 level of industry plan. The following figures indicate this development (in metric tons, figures for 1936 in brackets): Sulphuric acid 393,000 (1,441,200), calcium carbide 304,300 (900,000), and caustic soda 130,900 (435,000).

New German Synthetic Sugar.—Zukerith, a substance reported to be four or five times sweeter than beet sugar, has been developed by the Foodstuff Laboratories Kurth, Oberursel.

New Corrosion Inhibitor.—The Bee Chemical Company, Chicago, has developed a corrosion inhibitor for steel and other ferrous metals. The product has as its active ingredient the barium salt of an alicyclic sulphonic acid.

Czechoslovakia's Increased Exports.—An official survey of Czechoslovakian trading figures shows that the country had achieved almost a balanced economy in the first seven months of this year, during which imports totalled Kcs 15,380 million and exports Kcs 15,342 million. Principal imports and exports were, respectively, raw materials and semi-finished goods Kcs 9,554 million; finished products Kcs 11,051 million.

Austrian Oil Refinery Dispute.—The Russian C-in-C in Austria, General Kurasov, has now replied to the protest of the U.S. military governor, General Keyes, regarding the seizure of the Lobau oil refinery near Vienna. He holds to the legal position that the refinery was German property, having been owned by the "Ostmärkische Mineralwerke." According to the Potsdam decision, it was therefore regarded as liable to seizure by the occupying power.

Scarcity of Cellulose Fibres.—Since the failure of the negotiations to obtain Swedish quality cellulose the industry of the British Zone in Germany has been entirely dependent on the output of the "Westfälische Zellstoff AG" at Wilshausen. This factory produces copper cellulose in insufficient quantities. The materials allotted by the Bi-zonal Economic Office from South Germany have only in small part reached the artificial fibre manufacturers in the Rhineland. The opinion of experts is that unless the situation improves quickly, large restrictions are inevitable.

Hungarian-Jugoslav Aluminium Development.—Further evidence of the progressive integration taking place at present in the economic affairs of Eastern Europe, is provided by the report that Yugoslavia and Hungary, which both possess extensive deposits of bauxite, have concluded an agreement for the development of their aluminium industries. Bauxite was formerly exported, but the establishment of a large aluminium plant is envisaged in the recently published Hungarian Three-Year Plan, for which electric power and caustic soda is to be supplied by Jugoslavia.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

INDUSTRIAL CERAMICS LTD. (formerly CERAMIC INDUSTRIES, LTD.), London, W. (M., 18/10/47.) September 9, £1000 debentures; general charge. *Nil. December 6, 1946.

GEORGE ROYSTON & SON, LTD., Barnsley, chemical engineers. (M., 11/10/47.) August 26, charge, to Yorkshire Penny Bank, Ltd., securing all moneys due or to become due to the bank on an account current; charged on certain moneys; (M., 18/10/47.) June 25, authority, securing to Yorkshire Penny Bank Ltd., all moneys due or to become due to the Bank on an account current; charged on certain moneys; also September 8, charge, to Yorkshire Penny Bank Ltd., securing all moneys due or to become due to the Bank on an account current; charged on certain moneys.

LAUTARO NITRATE CO., LTD., London, E.C. (M., 11/10/47.) August 5, deed, supplemental to trust deed dated October 22, 1925, etc.; charged on certain lands in Chile. *£3,652,970. January 10, 1947.

DURHAM CHEMICALS LTD. (formerly NEWCASTLE-UPON-TYNE ZINC OXIDE CO., LTD., & OUSEBURN TRADING CO., LTD.), Sunderland. (M., 18/10/47.) September 2, mortgage, to Percy Building Society securing £5488 11s. 8d. and other moneys, etc.; charged on property known as Penlea, Chester-le-Street. *£33,845. April 16, 1947.

LANGLEY ALLOYS, LTD. (Bucks). (M., 11/10/47.) September 1, debenture, to Swiss Bank Corporation securing all moneys due or to become due to the bank; charged on properties at Langley, and general charge (subject to etc.); also September 1, £150,000 5 per cent first debenture stock secured by trust deed dated August 22, 1947 (the issue is made by way of substituted security for £100,000 debenture stock secured by trust deed dated November 3, 1942, second debenture for £25,000 dated November 18, 1946, and third debenture for £25,000 dated December 2, 1946); charged on properties at Langley, and general charge (subject to etc.). *£167,373. January 13, 1947.

Company News

The name of **Ibex Securities Ltd.** (formerly Ipswich Laboratories, Ltd.), Bromley by Bow, has been changed to Ibex Enterprises, Ltd., as from September 22, 1947.

The name of **R & W Products Ltd.**, manufacturing chemists, etc., Derwent House, North Parade, Matlock Bath, has been changed to Clemmel Ltd., as from September 29, 1947.

Fisons Ltd., announces that its offer to purchase the issued preference and ordinary share capital of Bengers Ltd., has been accepted by the holders of more than 95 per cent of both classes of shares.

Powell Duffryn Ltd., announces a net profit for the year ended March 31 of £633,735. A final dividend of 5 per cent plus a bonus of 2 per cent is proposed on the ordinary stock.

The nominal capital of **Xenit Products Ltd.**, chemical manufacturers, etc., 95 Farnham Road, Slough, has been increased beyond the registered capital of £14,000, by £10,500, in 10,000 6 per cent cumulative preference shares of £1 and 10,000 ordinary shares of 1s.

Chemical and Allied Stocks and Shares

CONTRASTING with a general advance in British Funds which followed Mr. Dalton's latest cheaper money statement, industrial shares have declined on a wide front owing to confirmation that an emergency Budget will be brought in next month. The City is expecting increased taxation of company profits, and substantial additions and increases in the Purchase Tax. Until the Budget proposals are known, however, it is very difficult to assess the outlook for individual shares and the marking down of values has been indiscriminate. Nevertheless it is realised that if it is possible to achieve export targets many companies would be able to pay higher dividends even if there were a substantial increase in the Profits Tax. The most widely discussed topic in the City is whether it will be possible for Mr. Dalton to re-establish long-dated gilt-edged stocks on a 2½ per cent yield basis, which may be attempted if it is hoped to be able to limit the interest on British Transport stock to 2½ per cent. In order to achieve this it would be necessary for 2½ per cent Consols and Treasury Bonds to return to virtually their par level. This would mean an advance of 15 points over current market prices and would require substantial official support for the market.

Chemical and kindred shares have not been immune from the set-back in industrial share values which has been in evidence this week. Imperial Chemical fell to 44s. 9d. on which basis there is now a yield of nearly 4½ per cent with good prospects of the 10 per cent total payment being maintained according to the current views. Monsanto Chemical failed to benefit from the 15 per cent interim dividend, and after touching 57s. have declined to 53s. 9d., while Dunlop Rubber at 67s. reflected a good deal of profit-taking following their recent advance. W. J. Bush were 85s. and after 80s. B. Laporte strengthened to 81s. 3d. Lawes Chemical 10s. shares were 13s. and, in other directions, Fisons changed hands around 64s. 6d. British Glues & Chemicals 4s. ordinary receded to 18s. 9d. Turner & Newall were 71s. and British Oxygen 92s. 6d. United Molasses at 48s. 3d. have been relatively steady, the interim dividend being imminent. Lever & Unilever came down to 48s. 9d. and Lever N.V. to 43s. 9d. General Refractories at 21s., Borax Consolidated 53s. 1½d., and British Plaster Board at 24s. reflected the general trend.

Iron and steels were also lower, but in most cases declines were fairly small, sentiment having benefited from the further increase in output and the prevailing belief that nationalisation of the industry has been postponed for a year. United Steel at 25s., however, have reflected profit-taking following publication of the results, while Babcock & Wilcox fell back sharply to 67s. 9d. Guest Keen were 46s. 9d., Stewarts & Lloyds receded to 50s. 3d., and Dorman Long 25s. 1½d. Textiles lost ground moderately, Calico Printers being 21s., Bradford Dyers 22s. 4½d., and Courtaulds 42s. 9d. British Celanese at 23s. 3d. have been fairly steady despite the unchanged 8 per cent dividend, the market assuming that there are prospects of a higher payment for the current year, bearing in mind the end of E.P.T. which has borne very heavily in this case, the increased price of rayon and the industry's high export schedule.

Boots Drug were 57s. 3d., Timothy Whites 43s. 1½d., Sangers 31s. 3d., Griffiths Hughes 42s. 6d., and Beechams deferred 22s. 7½d. Paint shares reflected profit-taking following their recent rise, Pinchin Johnson being 55s. 9d. Goodlass Wall 35s. 9d., and International Paint £6¼ Oils moved closely with the general market trend and Anglo-Iranian at £7 15/16 were unsettled by the latest international news. Shell came down to 80s. and Burmah Oil were 69s. 4½d.

British Chemical Prices

Market Reports

A FIRM price position is reported in most sections of the industrial chemical market and an upward adjustment in quotations to cover higher costs seems unavoidable. Market conditions on the whole are unchanged, with activity influenced by the supply position, rather than the demand. Pressure on contract delivery is being maintained and there has been a good flow of inquiries for new business both on home and export account. The demand for red lead and white lead is brisk at unchanged rates and there has been a good call for nitrate of lead and the copper compounds. The potash products continue in strong request against the limited supply position, and the demand for the majority of the soda products is in excess of the quantity available for delivery. There is a ready outlet for acetic acid supply and also for acetone and formaldehyde. Glycerine is in good demand at the higher rate now obtaining and sustained demand is reported for the coal tar products, and a good export inquiry is reported, particularly for pitch, which commands a higher price for exports and home trade. The expected revision of controlled home trade prices for tar products has not yet materialised, but it is understood that the question is receiving active consideration.

MANCHESTER.—A fair volume of fresh inquiry for both light and heavy chemical products, on home as well as on export account, has been reported on the Manchester market during the past week. Such materials as soda ash, chlorates and bichromates are available in insufficient quantities to meet full requirements and supplies are being quickly absorbed. The potash products generally, as well as the magnesia and ammonia compounds, are meeting with a steady demand, while pressure of supplies of the mineral acids is well maintained. In some sections of the fertiliser trade a steady business is reported, and in the tar products market most lines are finding a prompt outlet.

GLASGOW.—There has been no noteworthy change in the Scottish chemical market during the past week. Conditions generally have been quieter than of late. It is perhaps of interest that there are certain chemicals which are not being fully taken, due to the fact that other chemicals necessary for use in the same process are not available, or not available in sufficient quantities to make the process an economic proposition. In the export market, conditions have also been a little quieter, but some firm orders have again been received. Good grades of zinc oxide are in heavy demand, as also are insecticides, for which demand in the tropics is not so seasonal.

The Chemical Age

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Research as a Career

"WHAT shall I be?" is still as great a problem as ever it was, though for different reasons. Before the first world war, the difficulty was to decide in what line there were the best prospects of obtaining employment. One might, of course, have a special bent, and then nothing would stop one; but that was not very usual, and most people drifted into whatever industry first offered them a job. To-day, there is a shortage of labour, and an even greater shortage of trained staff. The Ministry of Labour has published a whole series of booklets telling the young man and woman how to go about the business of choosing a trade or profession, what qualifications are needed and how these can be obtained. Many professions, through their professional bodies, are publishing books on careers. Industries tend to do the same thing. Private firms are also not behind the times and several of them have explained what careers are open to those who enter into their employ. These books have dealt with chemistry and physics—mostly as applied to specific industries—with engineering, with accountancy, and with the whole range of the more reputable trades and professions.

What appears to us to be new ground is broken by a book that has lately come into our possession entitled: "Research as a Career," written by Dr. R. A. Collacott and issued by the Advisory Bureau for Research. We are a little uncertain from what angle to view this work, for it appears to be written with a view partly to suggesting that one method of entering into the research field is to start as a washer-up of laboratory apparatus. We do not doubt that there have been eminent research workers who have started that way, being highly gifted both with brains and the capacity for hard work. It is, as this book rightly says, the hard way by which to enter research as a profession and it is not usual for those who enter in this way to progress very far up the ladder. More usually they will drift away into more practical directions and may ultimately end up as works managers. That is not "research as a career," however; it is research as a stepping stone to a career.

The first thing to be decided by the prospective entrant, and the question remains open in our view after reading the booklet, is "what constitutes research?" We do not ask this question purely in a spirit of criticism, but because it seems desirable that someone should give to the world a definition of research. No one would doubt that a professor in his laboratory bent on enlarging the boundaries of knowledge is engaged on research. At the other end no one would class as research routine testing of materials to ascertain their chemical composition and physical properties. The term "research," it is well to remind ourselves, has extended far beyond the bounds of science. We read of economic research, educational research, geographical research (once called "exploration," before the world became research-minded), historical research, legal research and even "market research"—a term we ourselves have been guilty of using. All this sounds very easy—until we begin to inquire what some of these terms mean. This present book

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provides an example: Dealing with market research we read that "field investigators are provided with a questionnaire which contains questions relating to the subject concerned which require a positive or negative reply, such as *Don't you use Blank's chewing gum? . . . If not, don't you like the taste? . . . Or the size?* The field investigator is required to approach people of different types and obtain their reactions to these questions." Is this research? Dr. Collacott seems to suggest that it is.

Turning from this example, we read that "unfortunately much of the research work carried out by chemists is of a routine analytical (character?), which causes much disappointment among qualified chemists who aspire to original research." Is routine analytical work to be classed as "research," even if conducted in a research laboratory? Again, it is stated that "researches into legal problems are commonly made by specialist solicitors or by junior barristers on the behalf of Counsel." What is the distinction between this sort of work and "consulting the literature," which is an ordinary event in the life of every professional man who wants to know what facts exists before he commits himself further. Is looking up facts in a textbook a form of research?

It is time that some clear definition was given about what constitutes research, for if it is not, the professional research worker will soon find that he is two-a-penny and that his prestige has gone. What shall we make of such a statement as this: "Research experience—in any sphere whatsoever—can be gained at home (as a hobby) in the manner suggested by the Advisory Bureau for Research." The basis of training for research must surely be that the research worker shall be thoroughly trained in advance in his subject or science before trying to enlarge the boundaries of knowledge. True research is something very different from the experimenting that any boy will do when given a laboratory in which to play. But the popular Press and many others who should know better, often confuse these things. The nation is "research-minded," but it will soon cease to be so if every goose is converted into a swan.

Whether a man enters the scientific profession in order to stay there or not, there is no doubt that the training provided by the research laboratory gives him an independent, original outlook which is most valuable in many walks of life. There are many holding high positions who started on a scientific career but got side-tracked for one reason or another. As Dr. Collacott puts it, "The advanced knowledge to be gained from research suits a person admirably for senior administrative posts, particularly in economics and commerce. For in the advanced study of particular problems a person develops an idea of the difficulties and means of overcoming other difficult problems; receives also an insight into the sources of information and meets those who are capable of giving help to solve the most baffling of difficulties." In the light of this fact does it matter whether the demand for research workers will continue on the present high level? Dr. Collacott is uncertain whether there will be such a demand in the future as is now being experienced. But there will always be a demand for the trained scientific mind. We doubt whether many young people set out in life to make research their career. That comes after they are trained and are found to possess the necessary gifts. What is immediately necessary is that more first-class brains shall set out to become chemists and chemical engineers. They can safely be left to find their particular niche when they have been trained and given experience in industry.

NOTES AND COMMENTS

Reparations in Kind

WHATEVER foundation primitive war may have provided for the *Vae victis* dictum in ancient Rome there can be little doubt that the converse no longer holds good. The fruits of victory are few and almost invariably bitter. That must serve as consolation for the outcome of the long deliberations by the occupying Powers on the scale of German industry and the proportion and allocation of reparations. More than two years' experience of nursing Germany's moribund and disordered economy have persuaded the authorities to cut by more than half—to 682—the number of plants which were scheduled on the morrow of victory to go as reparations to the Allies; and of these 25 per cent go to the U.S.S.R. and Poland and of the remainder Britain is to receive 28 per cent—perhaps two years hence. Chemical undertakings earmarked for reparations, details of which are given on another page. number 42, and it is evident that Britain's 28 per cent of the Western nations' share of these will add much less to this country's chemical potential than some of the large-scale enterprises foreshadowed here in recent industrial news stories. And, notwithstanding the restriction of capital enterprise and building deadlocks, the latter are fairly certain to bear fruit first. Meanwhile, whatever long range prospects the chemical industry may have cherished of an effective accretion of strength from Germany's wartime equipment they are not encouraged by the semi-official statement this week that the U.S. Foreign Liquidation Commission are already offering to their home industry use of part of the dynamite plant near Hamburg and installations from the Lippoldsberg Paraxol plant.

World Oils and Fats

THE stringent world shortage of oils and fats should by now be news to no one—least of all perhaps the housewife, for whom the new cut in U.K. butter rations is another reminder on the domestic plane of a shortfall which is exacting its penalties in almost every sphere. Although the story has been told piecemeal repeatedly in home and overseas news items the complete picture was lacking until Mr. Geoffrey Heyworth, chairman of Lever Brothers and Unilever, Ltd., assembled the facts in their perspective at the recent annual general meeting of his companies. THE CHEMICAL AGE, in common with most other responsible journals, recognised (within the meagre limits of the paper ration) the value of Mr. Heyworth's study of what oils and fats the world may now count on, how much it lacks and of the prospects of making good the very formidable deficit. Those admittedly rather inadequate summaries of Mr. Heyworth's thesis which appeared in the Press have now been supplemented by the publication by the companies of the analysis in its entirety, quoting all the relevant data and representing, incidentally, a useful, timely lesson in economics.

Balance Destroyed

MR. HEYWORTH has given the factual background against which the present-day scarcity of fats must be seen. The annual world supply of oils and fats pre-war amounted to nearly 20 million tons, principally from the United States, India, China, the Dutch East Indies, the Philippines and the Argentine. Europe, excluding Russia, produced 4 million tons, mainly in the form of butter, animal fats and olive oil. But of this 20 million tons most remained in the countries where it was produced and only about 5¾ million tons a year was exported. Of the importing countries, the United States was only 85 per cent self-supporting and Great Britain only 10 per cent self-supporting. The net shipments of oils and fats to Europe, excluding Russia, were about 3½ million tons, *i.e.*, 61 per cent of the world production available for export. Two million tons came from the British, Dutch, French and Belgian colonial empires and an additional three-quarters of a million tons from the British Dominions, mainly India and Australasia. War abruptly eliminated supplies from the Dutch East Indies, and they have not been resumed to the extent that had been hoped. Sumatra, which exported 220,000 tons of palm oil in 1938, now is prevented by political unrest from exporting anything. Manchuria, which exported the equivalent of half-a-million tons of oils and fats, is now sending a mere few thousand tons a month of soya bean. That story is repeated throughout the world. Increased consumption in producer countries and rising populations, which in the case of India has withheld more than two-thirds of pre-war exports, and a serious reduction in production of oils and fats in Western Europe have had the inevitable result. Mr. Heyworth does not disguise there is no magic solution; but he does stress one or two mitigating possibilities to which insufficient attention has been paid. Need international whaling be restricted to 320,000 tons of oil, compared with 500,000 tons pre-war? Price controls, moreover, though they cannot yet be wholly dispensed with, are producing inflated prices—as industry has good reason to know—and artificial conditions which are inimical to a continuing market supply. Normal interplay of supply and demand is an essential and it can be revived, says Mr. Heyworth, if food subsidies in this country were abolished and high prices followed by consumer resistance were allowed to play their traditional part.

Austria Can Do It

IT is a sobering fact that the highly-mechanised economy of Europe, when overtaken by one of the crises of its history, must look for salvation mainly to the labours of one class of its workers—the coal miners. The Reid Report of 1945—*vade mecum* of the British coal industry's problems—made it clear that whatever improvements might accrue from nationalisation, or from the introduction of more and better machinery, increased production depended upon the individual miner, his enthusiasm, and the regularity of his attendance. A recent report by the Allied Commission for Austria, makes the same point in relation to the Austrian coal miner. In drawing comparisons, however, it has to be remembered that over 70 per cent of British coal is mechanically cut, whereas in Austria, owing to the nature of the seams, the bulk of the 220,000 tons of brown coal mined every month must be hewn with the pick. Thus the remarkable maintenance of production tempo—in the first six months of this year nearly 1,500,000 tons of coal were produced (90 per cent of the pre-war level) -can be regarded as a laudable effort. The 8400 miners who work in the 16 mines of Styria and Carinthia hold in their hands the keys to Austria's recovery and their steady record of achievement has been maintained in the face of acute material shortages and difficulties. These results have been due to the spirit of enterprise and improvisation with which the manifold shortages have been met; in this respect, the rôle of the British advisers has been a leading one. The report deals with the labour problem, training scheme, with food, clothing and housing problems, and with the miner's social welfare. In the light of recent events, it is a document which everyone should study—especially, we suggest, the National Coal Board and the colliery force in this country.

Another Chemical Notation ?

AN entirely new method of naming chemical compounds by means of sets of ciphers was outlined in a paper presented at Birmingham University to the Royal Institute of Chemistry, the Society of Chemical Industry and the British Association of Chemists by Messrs. M. Gordon, C. E. Kendall, and W. H. T. Davison, of Fort Dunlop chemical research division.

Their paper, "Chemical Ciphering—A Universal Code as an Aid to Chemical Systemisation," indicated how any type of compound could be described, as far as its structure is concerned, by an arrangement of letters and numbers, which would probably be shorter than its traditional name. The scheme is specially adapted for use in conjunction with a punch card system on machines of the Hollerith type and the essence of it is that, for example, to search for all compounds having a certain atomic structure would be simplified as it would be necesesary only to operate the controls on a mechanical sorting machine for all relevant cards to be immediately selected. The paper has been submitted to the Codification Commission of the International Chemical Union.

Scale of Reparations Announced

Britain's Small Allocation of Chemical Plants

BECAUSE German economy has been divided into Eastern and Western zones, independent of each other, the level to which German industry was to have been reduced by reparations and demolition has been drastically raised. That is the keynote of the statements issued last week on the authority of the British and American commanders-in chief in Germany announcing that 682 industrial plants in the Anglo-U.S. occupied zones are to be dismantled and distributed as reparations, less than half the number of plants or installations listed in accordance with the Potsdam agreement. That agreement provided for the removal of 1636 plants or parts of plants.

42 Chemical Plants

The present schedule of plants for removal are divided as: War plants 302, ferrous metals 92, non-ferrous metals 11, chemicals 42, mechanical engineering 224, electrical engineering 4, shipbuilding 3, power plants 4. Of the total, 25 per cent will be allocated to Poland and Russia and the remainder among the other Allied nations. Of this residue Britain's share will be 28 per cent.

Plants Scheduled

The names of 42 chemical-manufacturing concerns earmarked for reparations have now been communicated to THE CHEMICAL AGE by the Foreign Office. On the assumption that the above percentage shares will apply with equal force to individual industries (which seems unlikely, but is the only basis upon which approximate calculations can at present be made) Britain will obtain possession of the plant and equipment of (at most) 10 of these factories, a Foreign Office official indicated. The complete list appended below relates in some cases to entire plants, and in others to parts of plants or sections.

A.G. FUR STICKSTOFFDUNGER, Knapsack: Activated carbon; acetone from acetic acid. BLUMBERG AND CO., Lintorf: Pyrotechnics. DYNAMIT A.G., Schlebusch: Glycerine distillation; trinitrotoluene. DYNAMIT A.G., Troisdorf: Nitropenta; Vulcan fibre; phenoplasts; celluloid. HENKEL & CO. G.m.b.H., Dusseldorf: Soap powder; distillation of glycerine. I.G. FARBENINDUSTRIE, DORMAGEN: Perlon U.; ELBERFELD: Cellulose derivatives, miscellaneous resins; HOLTEN: Ethylene oxide, ethylene dichloride; LEVERKUSEN: "Sulfigran" (sodium sulphide by hydrogen reduction of sodium sulphate), Atebrin, polyamides, miscellaneous resins, hydrazine, hydrate of activated carbon, nitration of toluene; UERDINGEN: Electrolytic chlorine and caustic soda, alkydal resins; ZWECKEL: Ethylene oxide, ethylene dichloride, polyethylene, bleaching powder. I.G. SAUERSTOFFWERK, Duisberg: Liquid oxygen and bottled industrial oxygen. KABELWERK DUISBERG ABTEILUNG ZUNDERFABRIK, Mulheim: fuzes and detonators. OXO-GESELLSCHAFT, Oberhausen: Higher aliphatic alcohols. PYROTECHNISCHE FABRIK HANS MOOG, Wuppertal: Pyrotechnics.* PYROTECHNISCHE LABORATORIUM W. NORRES, Dorsten: Pyrotechnics. V.D.M. HALBZEUGWERKE SPRENGKAPSELNFABRIK, Leverkusen: Detonators.* VEREINIGTE ZUNDER AUG KABELWERKE, Lage/Lippe: Fuzes. WECKE FERD. NACHF., Wuppertal: Pyrotechnics. DONAR G.m.b.H., Wesermunde: Pyrotechnics. SCHICKERT, OTTO & CO., A.G., Rhumspringe: 85 per cent hydrogen peroxide (including power station). SCHICKERT, OTTO & CO., A.G., Bad Lauterberg: 85 per cent hydrogen peroxide. BURMESTER, GUSTAV, Trittau: Pyrotechnics.* STOLZENBERG, Altona: Gas masks. ANORGANA, Gendorf: Chlorine and caustic soda; acetaldehyde; glycol. DR. ALEXANDER WACKER, Burghausen: Plastics (based on cellulose acetate); solvents. I.G. FARBEN, Gersthofen: Wax. KOPP & CO., Munich: Soap products. CHEM. WERKE V. TRANSCHE & CO., Gersthofen: Hydrazine hydrate. VEREINIGTE FLOSSPOTWERKE, Stulln: Hydrofluoric acid; sodium fluoride; synthetic cryolite; potassium bifluoride; sodium fluoro silicate. ELECTROCHEMISCHE, Munich: Concentrated hydrogen peroxide KALLE & CO., A.G., Wiesbaden: Methyl-ethyl- and cellulose types of products. CHEM. WERKE KURT ALBERT, Wiesbaden: Phenoplasts (moulding powder). M. KAPPUS, Offenbach: Soap Products. I.G. FARBEN, Hoechst: Uresin; polyvinyl acetate; carboresin; sulphur black; solvents; chlorinated solvents, dinitrobenzene. P S. MOBBS, Giessen/Lahn: Soap products. ROEHM & HAAS, Darmstadt: Soap powder. I.G. FARBEN SAUERSTOFFWERKE, Griesheim: Industrial gases. KASSELL -MITTELFELD: Industrial gases. DEUTSCH PYROTECHNICS FABRIK, Cleeborn: Pyrotechnics. KRAEMER & FLEMMER, Heilbronn: Soap products. SALINE LUDWIGSHALL, Bad Wimpfen: Sodium fluoride; aluminium fluoride; synthetic cryolite..

Prohibited Industries

Although this list is represented as being final, some small changes are still likely to be made and the plants of which Germany was to have been deprived on security grounds by decision of the Control Council

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* Already Allocated

DISTILLERS' EXPANSION PLANS

SPEKE TO BE PURCHASED : SUBSIDIARY FOR STREPTOMYCIN

A £2,000,000 expansion of plant to provide large increases in the manufacture of solvents, plasticisers, acetic acid and anhydride at the Hull works of British Industrial Solvents (a subsidiary of the Distillers Company) was referred to by Mr. H. J. Ross, deputy chairman of the Distillers Co., Ltd., at the annual general meeting in Edinburgh on October 15.

A reorganisation of the plastics group is also being carried out with a view to centralising and increasing manufacturing operations at Barry, South Wales. New plants for subsidiary companies which will produce a range of synthetic resins, adhesives, moulding powders, and compounds are in course of erection. The cost of these extensions will also be about £2,000,000.

Penicillin and Streptomycin

Mr. Ross said that an agreement had been reached with the Ministry of Supply for the company to take over the Speke penicillin factory, which the company had erected and operated as agents for the Ministry. "The demand for penicillin," the report points out, "is still increasing, and it is considered that this acquisition will fit in logically and effectively with the company's research and development work in the production of streptomycin and in the field of anti-biotics generally." This new development will be operated through a subsidiary company to be formed with a capital of about £1,000,000.

It was hoped that a new plant for the manufacture of the plastic polyvinyl chloride, which will be marketed under the name "Geon," will be in operation soon. Progress in the general programme has, however, been disappointing due to serious shortage of construction materials and to changing degrees of priority.

Petroleum Chemicals

Confirmation was given in the report of the provisional agreement between the Distillers Company and the Anglo-Iranian Oil Company for the erection of a large plant for the production of chemicals from petroleum. Details of this scheme have already been published. Subject to the approval of the authorities, it is proposed to establish the factory at Grangemouth, close to the oil refineries of the Anglo-Iranian Oil Company. But the report warned that a considerable time must elapse before this scheme can be completed.

Last week-end was announced the registration of British Petroleum Chemicals, Ltd., the product of the Anglo-Iranian and Distillers Companies agreement. Although it is understood that the undertaking will require some £5 million to capitalise it, the new private company has been registered with an initial capital of £100. The declared objects of the company are "to manufacture, treat and turn to account chemicals, whether derivatives or compounds of petroleum, natural gas, or shale oil, or of any other nature, etc."; and its registered office is at 21 St. James's Square, S.W.1. (Details about the board of the new company appear in the Personal column.)

Scale of Reparations (*Continued from p.* 559)—

in March last year are not included. This decision prohibited the production of aluminium, beryllium, vanadium and magnesium and sanctioned only temporarily the manufacture of ball bearings, synthetic oil, synthetic ammonia and synthetic rubber. A final decision as to the future of these plants has still to be made and, meanwhile, these and surplus shipbuilding plants are not included in the list.

For a number of reasons, the official statement makes it clear, no early receipts of reparations are to be expected. Dismantling, it is anticipated, will take more than two years and additional postponements may arise from the necessity not to curtail drastically German employment or the attempts to re-establish a self-supporting economy. On the other hand, dismantling and removal of a few plants is already in hand and there have been several intimations that some plants are already being offered to American industry.

September's Record Exports

U.K. exports last month reached a value higher than any figure recorded since the war—£102,403,533. This, together with a reduction of imports to £160,708,411, against £174,039,765 in August, resulted in a reduction of the adverse balance of trade by £18,500,000. The adverse balance in September was still £58,300,000. Cars and machinery figure largely in the increased export total and much of the cut in imports is associated with food.

Fireworks Too

This year's seasonal fireworks displays will be affected by the Government's export drive. This is the implication of a statement reported to have been made by a spokesman of Messrs. Brocks last week. The firm's export target has been increased from 10 to 30 per cent, while it may be as high as 50 per cent next year.

Atomic Energy Reports

Widening Scope of Official Information

ANOTHER substantial addition has been made to the available authoritative literature on atomic energy in the publication by the Ministry of Supply of a list of a further 73 B.D.D.A. reports from the Government files. The latest summary comprises the lists already notified, of which the last—B.D.D.A. Nos. 74-98—appeared in our October 4 issue. Particulars are now recorded of 73 reports additional to the list recently given. These, too, are available for purchase from H.M. Stationery Office, P.O. Box 569, London, S.E.1, in the form of prints 9 in. by 7 in. from microfilms. The Crown retains the copyright and reproduction of these documents is not permitted. The following are the additions to he list recently published, quoting the B.D.D.A. number of each report, its title, author and date and the price including postage.

B.D.D.A.
No.

1. Investigation of the Delayed Neutron Emission from Fission Products, using a Modulated Source of Primary Neutrons. (N. Feather, Aug., 1941.) 3s. 6d.
2. Streamline Flow through a Pipe of Rectangular Cross-section. (R. Peierls, Nov., 1941.) 1s. 6d.
3. On the Possibility of a Slow-Neutron Chain Reaction. (O. R. Frisch, Nov., 1941.) 3s. 6d.
4. Separation of a Mixture of Three Components. (R. Peierls, Nov., 1941.) 2s. 10d.
5. On the Counting of Neutrons using a Thick Layer of Hydrogen-rich Material and a 'Proportional' Counter. (N. Feather, March, 1942.) 3s. 6d.
6. Directional Correlation in Fission Processes: Calculations relative to Possible Experiments. (N. Feather, April, 1942.) 5s. 6d.
7. The Motion in a Self-fractioning Centrifuge. (P. A. M. Dirac, May, 1942.) 6s. 10d.
8. Isotope Analysis of Uranium Samples by means of their α-Ray Groups. (O. R. Frisch, June, 1942.) 5s. 6d.
9. Absorption Measurements on the Radiations from 239U and 239X. (N. Feather, July, 1942.) 18s. 3d.
10. Determination of Number of Neutrons emitted from a Source. (J. Rotblat, Oct., 1942–Jan., 1943.) 13s. 7d.
11. Note on the Theory of Supersonic Diffusers. (F. Friedlander, Nov., 1942.) 10s. 3d.
12. Flow in the Gap between the Impeller and Diffuser. (F. Friedlander, Jan., 1943.) 4s. 10d.
13. Energy Distribution of Fission Neutrons. (R. Peierls, Nov., 1942.) 1s. 6d.
14. On a Modification of an Experiment suggested by Holt, Peierls and Frisch. (N. Feather, Nov., 1942.) 3s. 6d.
15. The Blast Wave due to an Intense Explosion. (G. J. Kynch, Dec., 1942.) 7s. 7d.
16. The Equation of State of Air at High Temperature. (K. Fuchs, G. J. Kynch and R. Peierls, Dec., 1942.) 15s. 7d.
17. Determination of the Total Neutron Collision Cross-Section for Hydrogen and Carbon. (E. Bretscher and E. B. M. Murrell, Jan., 1943.) 10s. 11d.
18. The Ratio between Absorption Cross-Sections of B. and H. (H. Halban, F. Fenning and H. Seligman, Jan., 1943.) 3s. 6d.
19. Fluorinated Lubricants. (J. R. Park, Jan., 1943.) 10d.
20. Some Theoretical Results on the Flow in Supersonic Diffusers. (F. Friedlander, Jan., 1943.) 8s. 11d.
21. Use of a Small Boron Chamber for Measuring Absolute Yields of Neutron Sources. (L. Kowarski, S. G. Bauer, H. Freundlich, A. N. May and H. Seligman, Jan., 1943.) 8s. 3d.
22. On a Shock Wave Problem Arising in the Theory of Supersonic Diffusers. (F. Friedlander, Jan., 1943) 5s. 6d.
23. Density Distribution near a Point Source. R. Peierls and B. Davison, Feb., 1943.) 4s. 10d.
24. Light Absorption by Two Black Hemispheres. (O. R. Frisch and R. Peierls, Feb., 1943.) 4s. 2d.
25. Regularities in Successive β-Disintegrations. (N. Feather, April, 1943.) 8s. 3d.
26. Boundary Conditions in the "Modified Diffusion Theory" for the Neutron Density Distribution in Presence of a Container (incomplete). (B. Davison, May, 1943.) 23s.
27. Boundary Conditions in the "Modified Diffusion Theory" for the Neutron Density Distribution in Presence of a Container (incomplete). (B. Davison, March, 1944.) 14s. 3d.
28. The Blast Wave due to an Intense Explosion. (J. Howlett, April, 1943.) 10s. 8d.
29. On the Counting of the α-Particles emitted by "Semi-Thick" Layers of Uranium: Effect of the Variation of Stopping Power with Velocity. (N. Feather, June, 1943.) 3s. 6d.
30. α-Particle Group Analysis using a Parallel-Plate Ionisation Chamber: Effect of Variation of Stopping Power with Velocity. (N. Feather, June, 1943.) 2s. 2d.
31. The Estimation of Deuterium in Water by the Temperature-Float Method. (W. A. Bell, July, 1943.) 12s. 11d.
32. On the Flow of Gases through Expanding Pipes. (F. Friedlander, July, 1943.) 14s. 11d.
33. Part I: Approximate Rate of Neutron Multiplication for a Solid of Arbitrary Shape and Uniform Density. (P. A. M. Dirac, Aug., 1943.) 7s. 7d.
34. Part II: Application to the Oblate Spheroid Hemisphere and Oblate Hemispheroid. (P. A. M. Dirac, K. Fuchs, R. Peierls and P. Preston, Aug., 1943.) 11s. 7d.
35. A Comparison of the Approximate Methods of Calculating the Critical Size of a Sphere. (A. H. Wilson, Aug., 1943.) 3s. 6d.
36. The Loss of Energy by Fission Fragments at High Temperatures. (G. J. Kynch, July, 1943.) 5s. 6d.
37. Physical Properties of Some o-Compounds. (W. N. Haworth, Aug., 1943.) 10d.
38. Reduction in Neutron Density caused by an Absorbing Disc. (T. H. R. Skyrme, Sept., 1943.) 13s. 7d.
39. Detector Response to Neutrons Slowed Down in Media Containing Cadmium. (E. Broda, H. Hereward and L. Kowarski, Sept., 1943.) 12s. 11d.
40. Escape of Energy from a Cylindrical Ionisation Chamber. (T. H. R. Skyrme, Oct., 1943.) 4s. 10d.
41. The Critical Radius and the Time Constant of a Sphere Embedded in a Spherical Scattering Container. (B. Davison and K. Fuchs, Nov., 1943.) 21s.
42. Critical Radius for a Hemisphere with a One-sided Infinite Container. (B. Davison, Nov., 1943.) 6s. 2d.
43. Differential Diffusion through a Capillary. (G. J. Kynch, Dec., 1943.) 5s. 6d.
44. Measurement of the Concentration of U235 in a Sample of Uranium Oxide enriched in this Isotope. (B. B. Kinser and S. J. Cohen, Dec., 1943.) 4s. 2d.

(*Continued overleaf*)

B.D.D.A.
No.

45. Barium 139 as Fission Indicator. (E. Broda, Dec., 1943.) 2s. 2d.
46. Szilard-Chalmers Effect in Permanganate Solutions. (E. Broda, Jan., 1944.) 2s. 2d.
47. A Neutron Standard. (E. Bretscher, G. B. Cook and G. R. Martin, Jan., 1944.) 6s. 2d.
48. Determination of the Number of Neutrons Emitted by a Radium-Beryllium Source. (E. Bretscher, A. P. French, G. R. Martin and M. J. Poole, Feb., 1944.) 5s. 6d.
49. The Effect of Small Departures from the Spherical Shape upon the Critical Size and Time Constant of a Sphere. (A. H. Wilson, March, 1944.) 5s. 6d.
50. Alpha-Ray Analysis of X-Isotopes. Part I. Apparatus. (F. L. Clark, H. Spencer-Palmer and R. N. Woodward, May, 1944.) 19s.
51. Tests Concerning the Reproducibility of the RaBeF$_4$ Neutron Standard and its Calibration as a Source of Neutrons. (D. H. Wilkinson, June, 1944.) 12s. 11d.
52. The Critical Size and Time Constant of a Spheroid. (H. Fairbrother, June, 1944.) 16s. 3d.
53. The Energy Spectrum of the Neutrons from the Lithium (p,n) Reaction. (B. B. Kinser and S. G. Cohen, June, 1944.) 4s. 2d.
54. Critical Radius of a Hemisphere Completely Surrounded by a Container. (P. D. Preston and B. Davison, July, 1944.) 8s. 3d.
55. The effect of Anisotropic Scattering on the Multiplication in a Sphere. (A. H. Wilson, July, 1944.) 3s. 6d.
56. Note on the Investigation of Spatial Asymmetry in Fast Neutron Fission, using a Double Ionisation Chamber and Pulse Analyser, and its Possible Bearing on the Problem of Large Capture Cross-Sections at High Energies. (N. Feather, July, 1944.) 6s. 2d.
57. Iodine 131 and 133 as Fission Indicators. (E. Broda, Sept., 1944.) 2s. 2d.
58. On a Possible Method of Investigating the Back-Scattering of α-Particles under Conditions of "50 per cent. Geometry." (N. Feather, Sept., 1944.) 2s. 10d.
59. On the Distribution of Pulse Sizes in a Parallel-Plate Ionization Chamber containing a Thick Layer of Hydrogen-Rich Material Irradiated with a Parallel Beam of Neutrons. (N. Feather, Sept., 1944.) 2s. 2d.
60. On the Distribution of Pulse Sizes in a Parallel Plate Ionisation Chamber containing a Thick Layer of Hydrogen-rich Material Irradiated with Neutrons (II): Effect of Oblique Incidence. (N. Feather, Oct., 1944.) 2s. 2d.
61. A Rapid Colorimetric Method for the Determination of T in Solutions of TO$_2$F$_2$+HF, by means of Hydrogen Peroxide. (A. A. Smales, Nov., 1944.) 4s. 10d.
62. Chance Coincidences between Non-Random Sequences, with particular reference to Experiments using a Cyclotron Source. (N. Feather, Jan., 1945.) 15s. 7d.
63. X-Ray Powder Patterns of some X-Metal Compounds. (H. S. Peiser and T. C. Alcock, March, 1945.) 5s. 6d.
64. Upper Limits of the Fission Cross-Sections of Lead and Bismuth for Li-D Neutrons. (P. K. Wright. April, 1945.) 2s. 2d.
65. The Range/Energy Relation for α-Particles of 0-5.3 MeV. in Ethylene and Polythene. (D. H. Wilkinson, May, 1945.) 9s. 7d.
66. A Photographic Plate Study of Neutrons from the D-D Reaction. (D. L. Livesey and D. H. Wilkinson, May, 1945.) 20s. 4d.
67. Differential Diffusion Through a Capillary (Part I. Mathematical). (G. J. Kynch, June, 1945.) 12s. 3d.
68. The Assignment of the Slow-Neutron-Produced Activities of Thallium and the Dual Disintegration of Radium E. (E. Broda and N. Feather, June, 1945.) 13s. 7d.
69. Preparation of a Strong Thin Polonium Source and Preliminary Experiments on the Yield of (a,n) Reactions. (E. Broda and P. K. Wright, July, 1945.) 7s. 7d.

(*Continued at foot of column two*)

Companies Act Reviewed

Wider Powers of Investigation

IN an address to the Chartered Institute of Secretaries in London last week, Sir Arthur Fforde, a member of the Cohen Committee on Company Law Reform, dealt with certain sections of the new Companies Act, and in particular with the wider powers given to the Board of Trade to investigate company activities.

The main purpose of the Act, said Sir Arthur, is to ensure that shareholders receive better information on their company's affairs which, in future, may be investigated if 200 or more shareholders, or if shareholders holding one-tenth of a company's shares so desire. Another sphere in which the Board can now exercise the right of investigation relates to ownership and control.

Director's Status

With regard to the election of directors, there is no alteration in the position of directors of private companies who on July 18, 1945, were holding office for life. Resolutions affecting the status of a director now require special notice, and must be communicated at once to the director concerned so that he can not only attend the meeting, but also make representations direct to the company.

A new provision is that a director's share dealings have to be disclosed. Annual meetings, he thought, should be regarded as being of greater importance. On the question, "What can be moved at an annual general meeting?" he said that the new Act overrides the articles of association and Table A of the 1929 Act, by which the business of an annual general meeting is governed at present. "It seems," he said, "that the question what can 'properly be moved' at the annual general meeting is, so far as the Statutes are concerned, at large."

Lower U.S. Mercury Output.—According to figures issued by the U.S. Bureau of Mines, mercury production in the second quarter of the current year declined by 7 per cent to 5700 flasks. It is also reported that Spanish producers have lowered their price by $22 to $82 in order to recapture their former share in the important American market.

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70. Differential Diffusion through a Capillary, Part II. (G. J. Kynch, Aug., 1945.) 17s. 8d.
71. Measurement of a Flux of Fast Neutrons with a Counting Pressure—Ionisation Chamber. (K. W. Allen, Aug., 1946.) 12s. 11d.
72. The Application of the Photographic Plate to the Quantitative Determination of Activities by Track Counts. (E. Broda, Aug., 1946.) 8s. 3d.
73. The Permeability of Metals to Argon and Helium. (British Non-Ferrous Metals Research Association, Oct., 1946.) 4s. 10d.

PRINCIPLES OF PRESSURE SPRAY NOZZLES

by H. L. M. LARCOMBE

ALTHOUGH nozzles of various kinds have been used in the gas and heavy chemical industries for many years, not much information bearing on this equipment is to be found in the literature. Methods of spray-drying and spraying of fungicides and insecticides have become increasingly important, while the plastics industry too is finding more and more uses for pressure nozzles.

The following article gives information on pressure nozzles which may be useful to chemical engineers.

The basic factor in all spraying equipment—whether for spray-drying or other purposes—is the spray nozzle, which in the present stage of development can be classified into three broad groups: (a) pressure nozzle, (b) two fluid nozzles or atomisation nozzles, (c) centrifugal spinner nozzles.

In this paper it is proposed to deal only with pressure nozzles. These depend primarily on the flow of a liquid, solution or slurry through an orifice under pressure, so forming an unstable jet which breaks up into droplets of varying characteristics. The nozzle may or may not be fitted with a device for imparting a spinning effect to the jet The pressure may vary from 5 to 1000 lb. per sq. in., depending on the viscosity, surface tension and density of the fluid and the nature of the droplet required.

Many Applications

Pressure jets can themselves be grouped into several sub-groups developed to meet the requirements of varying applications. These different types of pressure nozzle have different spray forms and different discharge capacities for the same pressure depending on their construction. The applications of these different nozzles are numerous and are tabulated in Appendix A, but this list is by no means exhaustive, nor are the applications hard and fast.

Another factor which has to be considered is that of materials of construction which may have to be corrosion resistant or erosion resistant (*e.g.*, in the case of handling slurries) or both. High discharge capacities at high pressures may reduce the life of the nozzle by cutting the orifice, deforming the spray form and altering the size of droplet. This is important in the case of spray drying where the size of the droplet eventually decides the sieve analysis of the finished product. Hard steel orifices, sintered orifices and jewelled insert orifices are used to combat wear.

Somewhat surprising in view of their wide applications is the comparative scarcity of literature about spray equipment. Kleinshmidt[1] in U.S.A., and Doble and Halton[2] in Great Britain, have published works on the subject. There is a certain amount of material available on oil atomisation in diesel engines, but this has limited application in industry.

Of Practical Use

The material presented here does not approach the subject from the theoretical angle but attempts to give information which can be put to immediate use in choosing and constructing nozzles and determining the performance which can be expected from them. The information has been obtained from various sources and covers actual figures obtained from proprietary types of nozzles and experimental types. References will be made to certain specific applications which offer interest, but generally the information is generally applicable.

Another source of information on the construction of nozzles is patent literature. Most of the nozzles detailed in patents are of involved construction and are designed usually with one particular fluid in mind and the proportions have been determined with regard to the characteristics of that fluid. It is difficult to decide whether patent specifications indicate any reliable line of approach to designing a nozzle for a particular fluid. There is, however, one trend which is clearly shown and that is the tendency to impart rotary motion to the fluid before it reaches the orifice.

Droplet Formation

The spray nozzle performs three distinct functions—breaking up the fluid into droplets or particles of the proper size, forming these particles into suitable shape and distributing the particles into a certain spray form.

The mechanism of spray formation consists in first drawing out the fluid into thin sheets, threads or filaments. All these forms are very unstable and under the combined action of surface tension, internal viscous forces, and turbulence of the gas into which the liquid is being sprayed, they break up into droplets. If the liquid has any rotary motion as it passes through the jet when the pre-droplet characteristic is a thin, cone shaped filament or sheet; if no rotary motion is present the pre-droplet characteristic is a thread form.

These two distinct types of pre-droplet characteristic are very important in certain applications. In spray drying, a sheet characteristic will give a resulting particle of hollow aerated structure giving a low density powder, whereas a thread characteristic will give more solid particles, resulting in a high density powder. Fig. 1 shows various constructions of nozzle with and without rotary motion and indicates the type of spray formation obtained.

It will be seen from Fig. 1 that the rotary motion of the liquid through the orifice forms a widening conical film which is converted into droplets. A very interesting phenomenon is apparent in the formation of such drops. The motion of the air past a surface at high velocity gives rise to turbulence.

Effect of Turbulence

If the surface is not rigid, as with the fluid sheet at the exit of a nozzle, the action of the turbulence on the surface creates a series of waves. When the sheet is acted upon on both sides by the turbulence (like a flag flying in a breeze) the waves build up very quickly and cause a whipping effect on its surface so that it curls back on itself. The result of this curling back is to form a hollow tube of fluid which, because it is unstable, breaks down into hollow spheres. This characteristic is an aid in spray drying as the hollow spheres are dried or chilled into particles of the same formation. Here is the explanation of the low density product produced by this type of nozzle.

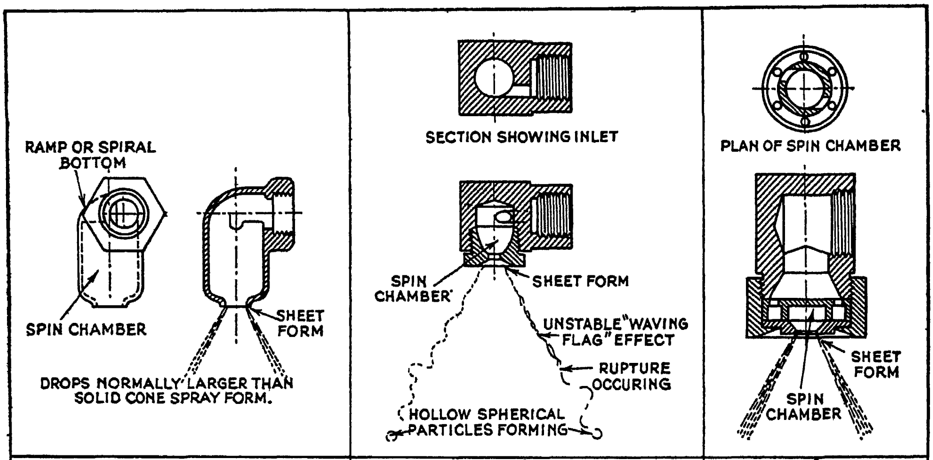
Edgerton and Germeshausen in the U.S.A. have succeeded in photographing this action which Fogler and Klemschmidt[3] reported. The photography showed clearly this whipping action and also the cone formation from which it originates. The photographs also show the effect of pressure and viscosity in a centrifugal type pressure nozzle.

By some means, usually a spin chamber, a rotary motion is imparted to the fluid just behind the orifice. When the pressure is too low to create any appreciable rotary motion the fluid is forced out in an initially smooth stream which begins to ripple and breaks into large drops. If the pressure is increased it begins to form a hollow cone which increasing pressure spreads and ruptures into droplets. With viscous fluids the thickness of the cone filament is, of course, thicker than with less viscous fluids.

"Bubble" Formation

It has been proved by spraying hot fluids into relatively cold atmospheres that the hollow particles are not formed by expansion of vapour within the particle, as was thought, but by the "flag waving" mechanism described earlier and illustrated by Edgertons' photographs.

The above paragraph and the paper quoted[4] are recommended particularly as a



	1	2	3
TYPE	RAMP OR SPIRAL BOTTOM	TANGENTIAL INLET	TANGENTIAL INLET
SPRAY FORM	HOLLOW CONE	HOLLOW CONE	HOLLOW CONE
PRE-DROPLET INITIATING FORM	SHEET	SHEET	SHEET
NORMAL ORIFICE DIAM. RANGE	1/8" TO 1 3/8"	0·037" TO 0·218"	1/16" TO 1/2"
PERFORMANCE REFERENCE	FIG. 5.	FIG. 6.	SEE BIBLIOGRAPHY (2)

Fig. 1

study for workers interested in spray drying.

In gas scrubbing, where a good dispersion is required, another important point is raised in droplet formation, that of recombination. If good dispersion of droplets of a similar size is not achieved, recombination will take place to the detriment of the scrubbing action. Gas atomisation gives little trouble with recombination since all particles are carried away with approximately equal velocity.

Gas atomisation, however, has drawbacks so far as application to scrubbing is concerned because of its long and slender spray form with little contact area. With pressure nozzles, which are usually used, the question of dispersion and recombination demands more consideration. Assuming droplets are to be projected from the nozzle into still air and that they are of a size to obey Stokes' Law, they will travel into the air for distances approximately proportional to their respective diameters before air friction brings them to stage where gravity is the only force acting on them. The smaller particles will therefore tend to collect in considerable numbers nearer the nozzle than the larger particles which will, because of their greater travel, collide with the smaller which will combine with them on impact.

In view of this it will be seen that a narrow droplet size range is desirable if recombination is to be reduced to the absolute minimum. If the droplet size distribution were accurately known it would be possible to calculate the probable amount of recombination.[1] This is seldom possible, however, and indicates the desirability of maintaining a vigorous gas flow.

Size Distribution

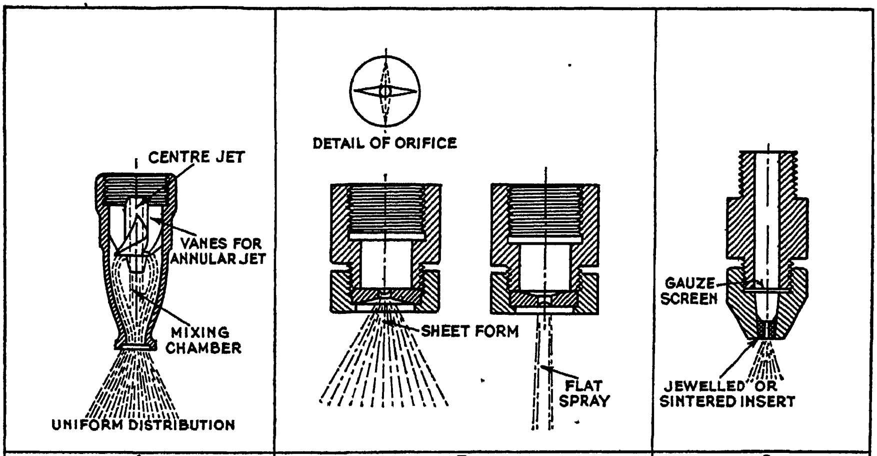
A small amount of research on size distribution of droplets has been carried out[1]. This, however, has been insufficient and further information is required on the following: (a) Distribution of drop size in the spray; (b) velocity of the drops; (c) recombination of drops.

These three characteristics are important in the specification of any spray nozzle. Different designs give different values of the above even when the orifices are the same size and when the nozzles are operated under the same pressure. There are some experimental data on a few nozzles, but nothing adequate. The technique for obtaining this information has been worked out[2, 5] and it is suggested that manufacturers should carry out studies to tabulate these characteristics.

Johnstone and Williams[6] have given a formula for the probability of collision of the drops of a given diameter, d_1, with the drops of any given larger diameter d_2 within the distance dL to be :[1]

$$\frac{d\eta_1}{\eta_1} = -\frac{\pi}{4}(d_1 + d_2)^2\eta_1\left(\frac{V_2 - V_1}{V_1V_2}\right)dL$$

These workers also give a formula for the



4	5	6
CENTRE JET	FAN SPRAY	MISTING
SOLID CONE	FLAT FAN FORM	NO PARTICULAR SPRAY FORM. DROPS TO SMALL.
THREAD	SHEET	THREAD
3/64" TO 3"	0·031" TO 0·375"	0·012" TO 0·04"
FIG. 4.	FIG. 7.	FIG. 8.

Fig. 1

fraction of the drops that succeed in passing through any short movement of distance (in which, L may be considered constant) without combination with any of the larger drops[2] :

$$\frac{\eta_1'}{\eta_1} = -\sum\left[\frac{\pi}{4}(d_1 + d_i)^2 \eta_i (\Delta \theta_1 - \Delta \theta_i)\right]$$

[V_1 = Linear velocity of particles d_1 in diam.
V_2 = Linear velocity of particles d_2 in diam.
L = Length of path of drop.
$\frac{\eta_1'}{\eta_1}$ = ratio of number of drops of diameter $_1$ leaving the section to that entering.
$d_i, \eta_i, \Delta \Theta_i$ = diameter, number, and time of passage respectively, of that size group of order i greater than $_1$.
$\Delta\Theta$ = quotient of the increment of distance by the average velocity.]

From the distance velocity curves the combination of the drops may be estimated by a step by step method.

From the total number of collisions and the probability of collision with each group's size the number of drops growing into a larger group size can be estimated when the coalescence results in a substantial increase in size. After this rearrangement of the size distribution for a short increment of the distance, a second step can be calculated as indicated above until a distribution could be given for any length of drop path. An illustration of this method is shown in Fig. 2.

Drop Size and Distribution

The energy relations for the formation of droplets can be grouped into three parts.

Distribution of Sizes of Droplets From Spray Nozzle—$\frac{3}{16}$ in. Orifice

Dia. of Drops. Microns	No. of Drops Measured	No. of Drops per C.C. of Spray	Percentage of Volume	Area pr C.C. of Spray sq. cm.	Percentage of Area
25	878	97,250	0.072	1.9	1.48
50	460	51,000	0.334	4.0	3.12
100	190	21,000	1.11	6.6	5.15
150	89	9,850	1.75	6.9	5.38
200	53	5,870	2.46	7.4	5.78
250	33	3,650	3.00	7.2	5.61
300	22	2,440	3.46	6.9	5.38
350	16	1,770	3.97	6.8	5.3
400	13	1,440	4.83	7.2	5.61
450	11	1,220	5.84	7.8	6.09
500	10	1,107	7.25	8.7	6.79
550	8	886	7.74	8.4	6.55
600	7	776	8.79	8.8	6.87
650	6	664	9.59	8.8	6.87
700	5	554	9.68	8.5	6.64
750	4	443	9.84	7.8	6.08
800	3	332	8.94	6.7	5.22
850	2	221	7.13	5.0	3.9
900	1	110	4.22	2.8	2.18
950	0	0	0	0	0
1,200	0	0	0	0	0
Total	1,811-	200,583	100.0	128.2	100.0

(Each size group includes drops in a range equal to the interval between groups, centring about the nominal size—*i.e.*, the 100 group includes drops from 51–149 microns).

1. The energy required to form the surface against the surface tension of the fluid which is the surface tension times the additional surface.

2. Since the time during which the droplets are formed is very short, very often a matter of microseconds, the rate of deformation of the liquid is very high and the viscous forces become very large. The energy required to produce the deformation is, therefore, appreciable although very difficult to calculate.

3. The energy lost due to inefficient application of energy to the fluid. This can be high in the case of badly designed nozzles, especially of the vortex type.

Pressure nozzles compared with gas or steam atomisation nozzles reveal extremely important differences. The energy which can be imparted to a lb. of liquid in the form of pressure is very small in comparison with the energy available in a lb. of air or steam. To illustrate this it can be shown that the energy available in a lb. of steam at 60 p.s.i.g. could only be equalled in a pressure nozzle by exerting 15,000 p.s.i.g. to a lb. of liquid water.

In spray drying the pressure nozzle has certain advantages over the steam atomisation type. Owing to the relative velocity and intimacy in the steam atomisation type of nozzle enormous rates of heat transfer can be expected and in view of the low temperatures which can exist in such nozzles due to adiabatic expansion, the fluids are chilled by the low temperatures. This tends to set primary particles rapidly if they are thermoplastic and prevents surface tension from acting to round the particle. An irregular shredded particle results. This is often not desirable in the product as it tends to interfere with a consistent sieve analysis.

(*To be continued*)

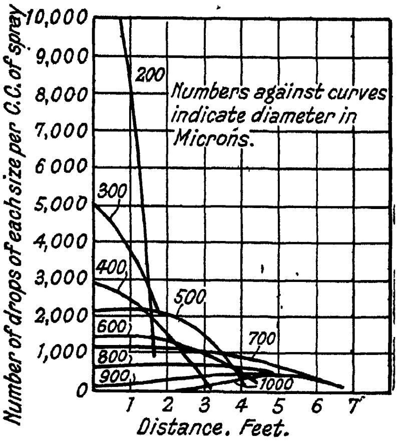


Fig. 2

French Oils and Fats—II

Summarised Results of Recent Research

THE application of X-ray diffraction methods to the study of soaps has been made possible as a result of Prof. J. J. Trillat's investigations in 1926 in the formation of metallic soaps, in which he observed not only the soap spectrum but also that of the excess fatty acids superimposed thereon.

This is one of the facts which the professor reveals in " X-Rays in the Study of Fats " (Part II, March, 123-130) which *Oleagineux* has published. He was thus able to study the structure of different soaps: mono-, bi-, and tri-valent.

Prof. Trillat illustrates his latest researches by reference mainly to lead soaps, but includes some also of mercury, potassium, and sodium, with various saturated fatty acids. From these studies he has been enabled to deduce the mechanism of certain reactions such as the fixing of oxygen on the double bonds of an unsaturated fatty acid (oleic, etc.), a matter of considerable interest in connection with drying oils.

Light on Lubrication

He proceeds then to deal similarly with alcohols, esters, amides, fats, waxes, polymethylene derivatives and ketones. Work with the fats in particular has thrown further light on the intricate mechanism of lubrication; and also in the study of fatty esters of cellulose in which there is periodicity varying with the number of carbon atoms (*Chim. et Ind,* 1944, *51,* 1).

The author notes that the method of oriented layers had indicated the importance of physical state and also of the support, and of rate of crystallising on orientation. Thus, if the support shows alkaline reaction (glass, mica) orientation is very good; but, if acid, there is no orientation. Further, it appeared to be of interest to see how orientation would occur on the surfaces of liquids, and this led to the design of a new method (in 1929) known as the tangential drop, the basic principles of which are described (see also *Jnl. de Physique,* 1929, Jan., *32*). The author is continuing his work at the Centre National de la Recherche Scientifique, Bellevue.

Natural anti-oxidants of palm oil. (May, 242-246.) Prof. P. Dubouloz and co-workers have already undertaken much research in this field and published several papers in *Bull. Soc. chim. Biol.,* 1941-5, they take a very modest view of the results so far achieved. The general problem of natural anti-oxidants in oils is still very obscure and they regard their work as fruitless on many points; but amid the darkness they believe some light may be discerned.

They believe at least one element, tocopherol, has been definitely identified as an anti-oxidant in palm oil. In collaboration with the I.R.H.O. they have continued their work at the Lab. de Physique de la Faculté de Medecin et de Pharmacie de Marseille, and conclude provisionally that oils originating from a certain species of oleaginous plant may well vary in respect to anti-oxidants both from various natural causes affecting the plant and from different mehods of preparation; the same as had been found with animal fats. These agents are present only in very small amounts and their isolation presents many difficulties.

Like other workers in the U.S.A. they, too, have used molecular distillation methods. So far, it is thought possible to study the different anti-oxidants in a given oil, to the extent, at least, of distinguishing them provisionally and stating the order in which they disappear during progressive oxidation of the oil, beginning first with those sensitive to alkalis.

Esterification of some higher fatty acids, with methanol and ethanol in the presence of catalysts; M. Loury and Mlle. M. T. Mellier (May, 254-259). Reference is made to the prior work of Gault and Chablay (*Comptes Rendus* Ac. Sc. 1941, *213,* 177) who showed that the acids—palmitic, oleic, lauric—esterified with methyl alcohol follow Berthelot's laws of chemical equilibrium; but the present authors have found that ethyl alcohol acts differently from methyl alcohol, permitting a more rapid reaction.

This greater reactivity of methyl alcohol may be explained either by the lower stability of the R-OH bond or by postulating some form of steric inhibition.

Lauric acid was prepared by methanolysis of palm-kernel butter, and palmitic acid similarly from palm oil, followed by saponification. These two, and also oleic acid, were esterified, using as catalysts hydrochloric or sulphuric acid, sulpho-benzene or sulpho-toluene in weak solution. Generally, it was found that excess alcohol favoured esterification, and that this could be completely attained with methyl alcohol in a relatively short time and at room temperature.

Edible palm oil. A letter (May, 265-6) from the Director of the Department of Agriculture, Malaya (Kuala Lumpur), describes some early attempts to produce edible palm oil, starting with the work of Dr. F. G. Reed, of Sungkai, Perak, and Prof. J. L. Rosedale, of the College of

Hydrogen Peroxide Development

Possibilities for Small Power Plant Operation

TWO chemical engineers of the Buffalo Electro Chemical Co., Buffalo, N.Y., in a report to a recent meeting of the American Institute of Chemical Engineers in New York, said that concentrated hydrogen peroxide—a tool of war that the Germans developed and the Allies duplicated—has great possibilities in the development of small power plants.

Hydrogen peroxide was used by the Germans with calcium permanganate to launch their V-1 bombs. The chemical reaction set up by these two materials is of explosive violence, but if controlled properly, can be used for useful work. According to the authors, this same reaction was used to drive turbine pumps in V-2 rockets, for powering rocket aeroplanes such as the Messerschmitt 163 at higher speeds than any of the propeller-driven planes, and for driving torpedoes and high-speed submarines.

When the Allies learned about the mechanism of the German V-1, the U.S. Chemical Warfare Service was assigned the task of developing a process for making highly concentrated hydrogen peroxide and calcium permanganate. The Buffalo Electro Chemical Co., Inc., was one of the firms approached. At that time, completely independent of any known Government need, the Buffalo Electro Chemical Co. engineering staff had completed a study of this difficult manufacturing problem and were ready to undertake its production.

Although small quantities, up to concentrations of 99 per cent, had been made in laboratories, this was the first time that the manufacture of a 90 per cent product had been attempted on a large scale. It is available in any reasonable quantities. The highest strength that had been manufactured for commercial purposes up to that time was 50 per cent.

Industrial Uses

" Research has been devoted to possible industrial applications of this new high concentrated hydrogen peroxide ", the report runs. " The reduction of the water content from the bleaching grades has produced a substantially new chemical; 90 per cent hydrogen peroxide has certain applications for operating small power plants where the factors of space and weight per horse-power are of paramount importance. It can also be used to supply additional oxygen to boost internal-combustion engines to meet emergency conditions. Although 90 per cent hydrogen peroxide itself is not sensitive to shock, in admixture with certain organic solvents it produces powerful explosives. These mixtures have the advantage over such explosives as dynamite and nitroglycerine in that they can be transported separately to demolition scenes without any hazard, yet upon mixing, some of these hydrogen peroxide-organic solvent mixtures are as powerful as TNT and have the additional advantage that they produce no nitrogenous poisonous gases."

French Oils and Fats (*Continued from p 567*)—

Medicine, Singapore, who recommended palm oil for cooking purposes in 1934. Some publications of 1935-6 are noted, and reference made to the use of palm oil in the Far East during the war, as a makeshift, in the absence of anything better. The letter concludes by stating there has now been a complete revulsion of taste and the demand is now negligible.

Food Investigation

The I.R.H.O. nevertheless attaches great importance, under present conditions, to the use of palm oil for food, and it may take a permanent place in the world's diet of the future. It claims to have introduced a special method of fractionating the glycerides of palm oil whereby this aim may be more surely achieved. (April, 175-185.)

Four short papers on the subject are contributed by MM. R. M. E. Michaux, R. Carrière de Belgarric, P. Mensier, and M. Loury, with illustrative coloured plate.

It is known that the melting point of a mixed glyceride is generally lower than that of the homogeneous glycerides of the same acid, especially if one of the esterifying acids is not saturated; and the m.pt. of a blend of these mixed glycerides will be still lower if a certain amount of homogeneous glycerides of non-saturated acids is added.

These considerations induced the Centre de Recherche of the I.R.H.O. to apply to palm oil the methods of fractional crystallisation already widely used in oils and fats technology, *e.g.*, by Buckley in Malaya in the case of glycerides of non-saturated acids of palm oil.

By this method and careful attention to cooling, the oil could be separated into two parts: one liquid at normal temperature and the other melting at about 104°F., the ratio of liquid to solid being approximately 1 : 2. The former makes a good table oil equal to groundnut or olive oil, while the latter is a solid white fat, usable direct as cooking fat or for margarine manufacture.

American Chemical Notebook

From Our New York Correspondent

REFLECTING recent sharp increases in the United States in the costs of raw materials and drums, the Du Pont Company has announced increases of one-half to three-quarters of a cent per lb. in the prices of its chlorinated solvents—perchlorethylene, trichlorethylene and methylene chloride. The new price of trichorethylene delivered is now 10¼ cents per lb. in lots less than a carload, 10 cents per lb. in carload of drums and 9½ cents in tank cars, as compared with 10, 9½ and 9 cents. Equivalent rates for perchlorethylene are 11½ cents per lb., 10¾ cents, and 10¼ cents, as compared with 10¾, 10¼ and 9¾ cents per lb. New methylene chloride prices are 13½ cents, 12½ cents, and 11½ cents, compared with 13, 12 and 11 cents. Du Pont has also announced that its new contact sulphuric acid works at James River, Virginia, has started operations and first shipments have just been made. The new unit is operated by the Grasselli Chemicals Department.

* * *

Mr. Philip B. Fleming, Federal Works Administrator and chairman of the President's Conference on Fire Prevention, has called for a co-ordinated effort to reduce the fire hazard involved in loading and transporting ammonium nitrate from American ports to foreign countries. "Nearly two-fifths of the solid nitrogen produced in the United States in 1947-48 will be in the form of ammonium nitrate," Mr. Fleming said. "A thorough study of the causes of ammonium nitrate combustion is imperative, but it would be a grave loss if the material should become so burdened with prohibitions and restrictions that it would not be available as fertiliser." Experts of the War and Agricultural Departments of the United States, municipal agencies and industrial and civil organisations directly interested in the chemical are now discussing safety measures for its manufacture, loading, and transportation.

* * *

The National Aniline Company's plant at Buffalo will be expanded under a programme expected to cost more than $20,000,000.

* * *

A new process for the production of synthetic gasoline from low-grade coal and lignite has been developed by V. F. Parry, E. O. Wagner, A. W. Koth and B. J. Goodman, of the United States Bureau of Mines, Golden, Colórado. In the new process, soft coal or lignite is poured in at the top of a double-walled cylindrical oven. Steam is introduced as the coal slides down between the walls toward the bottom of the retort, which is heated to about 1900°C. The steam and hot coal react to form synthesis gas, a mixture of hydrogen and carbon monoxide. This is piped off through a vent in the inside wall.

* * *

Continuing the downward trend that has been evident during the past three months, production of primary aluminium in the United States in June declined 6 per cent, measured on a daily basis, compared with May production, according to the Census of the Department of the Interior. This lapse in 1947 from near-capacity output of operating reduction works followed the suspension of production at the Longview plant of the Reynolds Metals Company. Leading secondary smelters on June 18 announced price cuts of ½ to ¾ cents a lb. on various resmelt grades. Production of primary aluminium in June totalled 46,259 short tons, according to official figures released last week. This compares with 53,032 short tons produced in March, 1947 (greatest total production for any month since August, 1944) and is the lowest since October, 1946.

* * *

The Disco Company, a subsidiary of the Pittsburgh Consolidated Coal Company, has announced plans for construction of a smokeless fuel-producing plant at Champion near Pittsburgh The rew plant, estimated to cost $3,000,000 will produce 280,000 tons of coke annually.

* * *

Completion of a new plant at Pittsfield, Mass., for the manufacture of magnesium oxide by the (U.S.) General Electric Company's chemical department, was announced last week by John L. McMurphy, manager of the Compound division. Mr. McMurphy said that the new plant, which will occupy about 10,000 sq. ft., will double General Electric's capacity to produce magnesium oxide. The new plant is equipped to purify, densify and grind crude magnesium oxide.

* * *

Seven chemicals are listed by the Bureau of Entomology and Plant Quarantine of the U.S. Department of Agriculture among those which proved reasonably efficient in the control of termites by soil poisoning in a series of unfinished experiments being conducted at Beltsville, Maryland. The seven chemicals are: sodium arsenite, lead arsenate, sodium fluosilicate, cryolite, phenothiazine, pentachlorophenol, and orthodichlorobenzine. In a preliminary report of results, the scientists emphasise, however, that soil poisoning is, in the main, a measure supplementary to primary termite-control methods of a structural nature, which offer permanent protection.

Sale of Trade Secrets

BETRO Defends its Dollar Scheme

AS a result of recent criticism of BETRO's offer last month to help negotiate the sale of British patents and "know-how" in return for royalties in dollars, Lt.-Col. H. A. P. Disney, BETRO's Administration Director, gave an informal talk to the Press in the organisation's library, Dover Street, London, W., on Thursday last.

Answering British criticism that BETRO is advising British manufacturers to sell their trade secrets for a " mess of pottage," Col. Disney emphasised that manufacturers were urged to take this course of action only if their products cannot be exported, *e g.*, where there are import bans or where the cost of manufacture in this country for sale abroad is not an economic proposition.

Fostering Competition

Replying to suggestions from the Press that BETRO advice could only lead to the setting up of competition abroad, Col. Disney explained that it is customary to include in the contracts, clauses forbidding sales in areas of interest to British manufacturers. On the question of the possibility of U.S. licensees improving upon British patents and " know-how " and thus being in a position to put British manufacturers out of business at the expiration of the agreement (usually for the duration of the life of the patent, but sometimes 5 or 10 years) the speaker reminded his critic that it was usual to include a clause providing for interchange of developments between licensor and licensee.

Recalling U.S. criticism that BETRO's activities in that country threatened to violate U.S. Anti-Trust Laws, he denied that conditions would be imposed with that object in view. " What are the Anti-Trust Laws, anyway?" he asked. " Surely it is up to the U.S. manufacturer to safeguard himself?"

Willing Buyers

According to Col. Disney, the scheme has already produced a crop of inquiries from both sides of the Atlantic with U.S. requests for " know-how " so far exceeding British offers to sell. Among the latter, however, are a process for making unshrinkable woollens, a soot destroyer, and a cleaning compound. American inquiries have included rubber goods, plastics, nuts, bolts and screws, and textiles.

Asked whether BETRO is prepared to assist any British firm, Col. Disney said that in theory the organisation's services were available only to members, and that membership is open to all firms upon payment of an annual subscription of £100. " However," he continued, " we should not refuse our help to non-members."

Next Week's Events

SATURDAY, OCTOBER 25

North of England Institute of Mining and Mechanical Engineers. (Associates and Students Section). Lecture theatre of the Institute, Newcastle-upon-Tyne, 1, 2.30 p.m. General meeting. Mr. Donald Hindson: " Some Aspects of Dutch Coal Mining."

Royal Institute of Chemistry. Oak Restaurant, 18 Kensington High Street, W.8, 7 p.m. Dance.

MONDAY, OCTOBER 27

Institution of the Rubber Industry. (Manchester Section). Engineers' Club, Albert Square, Manchester, 6.15 p.m. Mr. B. Gordon Darnton: " Incidentals in Latex Treatment."

Birmingham University Chemical Society. University, Edgbaston, Birmingham, 4.30 p.m. Dr. J. Sheridan: " Newer Views on Multiple Bonds and their Reactions."

TUESDAY, OCTOBER 28

Royal Institute of Chemistry. (Leeds Area Section). Chemistry Lecture Theatre, The University, Leeds, 6.30 p.m. Mr. R. K. Dickie: " The English Oilfields."

Society of Instrument Technology. Royal Society of Tropical Medicine and Hygiene, Manson House, Portland Place, W.1, 7 p.m. Messrs. J. O. V. Vick, C. Ramond, and W. Lindsay: " The Organisation of an Instrument Department in an Industrial Works."

WEDNESDAY, OCTOBER 29

Institute of Welding. Institution of Civil Engineers, Great George Street, London, S.W.1, 6 p.m. J. L. Adam: The Presidential Address.

Society of Chemical Industry. (Food Group). Burlington House, Piccadilly, W.1, 6.30 p.m. Professor A. Haddow and Dr. L. A. Elson: " Food and Cancer."

Royal Institute of Chemistry. Woolwich Polytechnic, Woolwich, S.E.18, 7 p.m. J. G. N. Gaskin: " The Examination of Questioned Documents."

FRIDAY, OCTOBER 31

British Association of Chemists. (Scottish Section). St. Enoch Station Hotel, Glasgow, 7 p.m. Short Papers and Discussion.

ALUMINIUM IN TASMANIA

FOLLOWING a one-year survey of territory near Launceston on the River Tamar, Tasmania, the Australian Government has decided upon the establishment of an aluminium industry there. This is the effect of an announcement by Mr. J. Armstrong, Minister of Munitions, to the Senate last week. Preliminary estimates indicate that there is sufficient bauxite for 30 years of full production.

GLASS IN THE LABORATORY—VII

Tools and Accessories Used in Lamp Working

by I. C. P. SMITH, B.Sc., F.R.I.C.

THE tools employed by the lamp worker are usually simple and many workers like to make up their own to suit their own style of working. However, sets of these tools are available and one such set is depicted in Fig. 1. The functions of the different tools will be described later in the articles describing the actual working of the glass, but the following are the points to look for in well-made tools.

The blade of the tool should be of a hard brass, thickness No. 16 or No. 14 s.w.g., so that it is not too easily bent when it is hot. The blade should be well fixed to the handle in such a manner that it will not loosen after repeated heatings. The handles should be fairly small in diameter, not more than ½ in. for the larger tools and down to ⅜ in. for the small ones, so that they may be easily rotated in the fingers. The edges of the tools should be nicely rounded—not brought down to sharp edges.

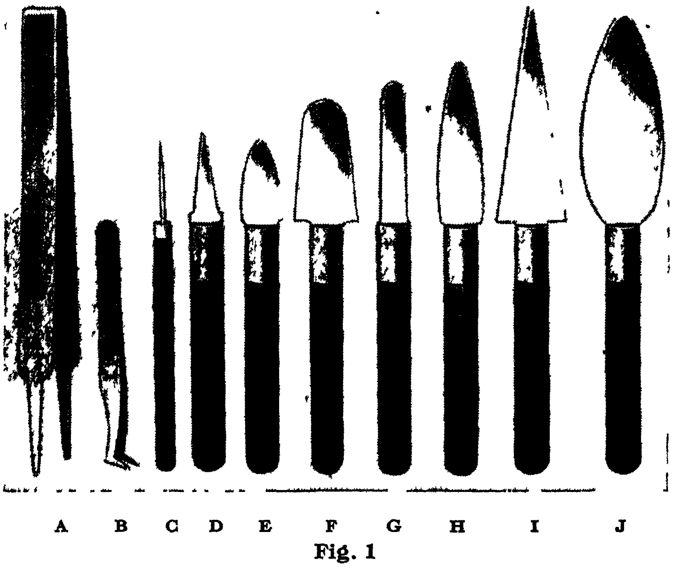


Fig. 1

In addition to the spike shown—C in the figure—many workers like to have a heavier one of about ⅛ in. diameter, and a "marlin-spike," as shown in Fig. 2, having a protecting flange for large hot work. For flattening-off purposes also the disc tool, Fig. 3, is employed, or a piece of hard flat graphite with a handle similar to that depicted in Fig. 4; in this a piece of electric conduit tubing is split, opened and shaped to form the handle; cardboard or thin asbestos is used between the metal and the graphite to ease the grip of the clamping screws.

Fig. 5 shows a small tool employed for rapidly opening flanges, and it is provided with a handle consisting of a length of ¼ in. diameter mild steel rod. The tool itself is made from one of the light alloys.

For shaping sockets, particularly of standard ground joints, hexagonal tools as shown in Fig. 6 are employed. They have been habitually made from a hard graphite, but owing to supply difficulties they have also been made satisfactorily in light alloy. These tools are provided with a steel rod for a handle. In addition, some workers use a simple flat tool as shown in Fig. 7 although its use requires greater skill. The sides are carefully finished to 1 in 10 taper, inclusive, and a tool is made for each size of socket. These tools are useful for finishing the ends of tubes for corks, etc., as an alternative to instrument G in Fig. 1. The construction shown—a hard-soldered joint in the rod, and the rod firmly located in the handle—is a sound one for these tools.

Some simple form of lubricant is always required for metal tools in order to prevent staining of the glass and to enable the tool to slide easily over the hot glass. Beeswax has been habitually employed for this purpose but it is liable to form a scaly or resinous residue and in addition it is sometimes scarce. There is a lubricant available, however, consisting of paraffin wax mixed with some colloidal graphite. This wax may have, in addition, a small quantity of a body of high molecular weight which will increase its viscosity and cling to the metal surface at high temperatures. These waxes have been found very useful in cases where the tool may become heated to redness, as the colloidal graphite is not rapidly burnt off and retains its lubricating properties up to 600°C.

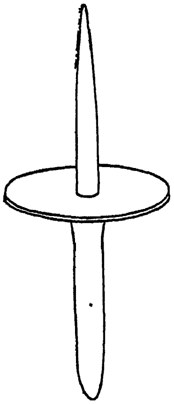


Fig. 2

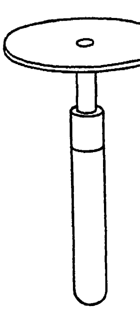


Fig. 3

In addition to the use of the graphited wax, many workers like to keep a vessel of water containing a dispersion of the colloidal graphite (aquadag). When a tool has become over-heated it is dipped rapidly into this vessel of water and picks up a layer of the colloidal graphite. The dispersion is made by adding 5 oz. of distilled water to, say, ½ oz. of the aquadag; this ensures proper mixing of the dag through the water, and use of distilled water ensures that the colloid is maintained in suspension. Colloidal graphite in the wax form or as aquadag or oildag may be used in many places in the mechanical handling of glass as in bench moulding, lathe working, etc. Fig. 8 shows a simple holder for flasks either for shaping the necks or joining side tubes on to the body of the flask; the arms are opened or closed by turning the handle. The holder is available in two sizes, which cover the usual sizes of flask up to 1 litre capacity. Fig. 9 is a diagram of a simple machine used for rolling a tube, as when flanging the ends, etc. It is adaptable to any size of tube up to about 4 in. diameter, and enables a comparatively unskilled worker to turn the tube steadily in the flame. For joining large tubes together in line two of these rests may be employed for each tube.

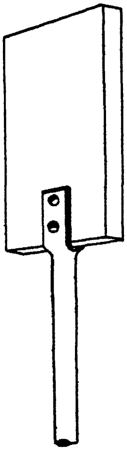


Fig. 4

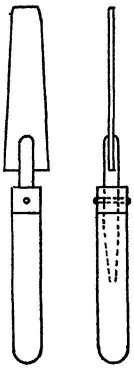


Fig. 7

Fig. 5

Fig. 6

When it is required to join two long lengths of tubing together each tube may be rested on two sets of these rollers, which are mounted carefully in line and the joining done by simply heating the adjacent ends of the tubes and bringing them together while on the stands.

It is frequently necessary to adapt an odd end of the working bench or table for glass working and in doing so it is well to make provision for unexpected requirements. The gas lead for the main blowpipe should be fully ¾ in. B.S.P. fitted with a mains cock and a rubber tubing teat which is bored out fully ⅜ in.; alternatively, a short length of ⅜ in. gas barrel may be employed for the teat. A second smaller gas tap is required for miscellaneous purposes such as an arrangement for keeping hot materials, etc., when doing complicated work, or for using the small cutting jet. A third gas point at the back of the bend is a useful adjunct for feeding a second blowpipe set at the back when carrying out large work. This should be controlled from the front of the bench as should the corresponding air point.

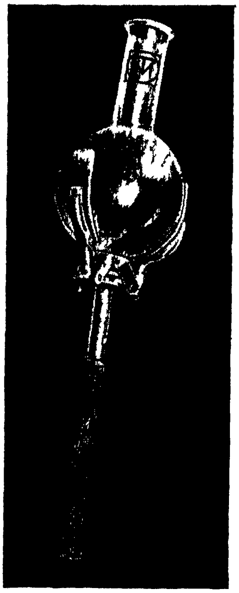


Fig. 8

Air leads should be at least ¾ in, B.S.P., preferably ⅜ in. This need for ample size of gas and air leads is stressed here, because very few pet-cocks or rubber connection teats of an alleged B.S.P. size have anything like this bore right through the stop-cock or teat. Some can be drilled out, but mains-cocks generally are advocated. Many otherwise good blow-lamps are spoiled by inattention to this point. When allowing for gas and air consumption, 30 cu. ft. per hour may be required for the gas, and 3 cu. ft. per minute for the air for each blowpipe. (The different units are in accordance with current usage.)

(Figs. 1, 5 and 6 are reproduced by courtesy of Messrs. A. Gallenkamp & Co., Ltd., and Fig. 8 by courtesy of Messrs. Towson & Mercer, Ltd.).

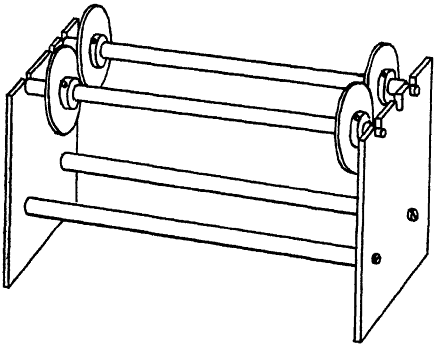


Fig. 9

Air Filtration

Work on Micro-Organisms

AT the first meeting of the current session of the Institution of Chemical Engineers, North-Western Branch, at The College of Technology, Manchester, a paper, "The Removal of Micro-Organisms from Air by Filtration," was presented by Messrs. S. G. Terjesen and G. B. Cherry. The paper described a method of producing large quantities of sterile air required to aerate the fermenting magma for such a biochemical process as the manufacture of penicillin.

The technique of Bourdillon, Lidwell and Thomas, it was explained, was selected as a reliable method of collecting and counting air-borne micro-organisms. The bacterial concentration of the inlet air used in these experiments was increased by infection with a suitable tracer organism and the air was passed through a separate pilot filter to avoid the disturbance of the conditions on an operating plant.

The filter consisted of a 3-in. thick slab of slag- or glass-wool, covered with supporting gauzes and fixed between perforated plates. Gaskets were used and pressure was applied to give a tight joint. When necessary, a backing of swansdown cloth can be used to exclude fibres from the filtered air.

Dust was removed from the inlet air by a bag filter and the air was mixed with a fine spray of a bacterial suspension produced by a Collison Inhaler. The droplets rapidly dried to give suspended single organisms in the air-stream. The air was filtered and then tested for bacteria by the above technique.

Slag-wool Effective

Staph. albus was used in some experiments, *B. subtilis* in others, and as the number of these organisms in the filtered and unfiltered air could be counted by the technique used, the efficiency of filtration was calculated. Fine slag-wool fibre was more efficient than a coarser glass-wool, but the former cannot be sterilised by steam because of the formation of channels through the filter. Air at 180°C. was a successful sterilising agent. It was found that packed towers containing oil and caustic soda solution, respectively, were useless for the removal of suspended single organisms, whereas the 3-in. pre-formed slabs of slag-wool were efficient.

Scottish Chemical Notes

(From Our Glasgow Correspondent)

CHEMICAL engineering and industrial experts were present at an inspection of the new East Kilbride town site, near Glasgow, last week. Board of Trade officials and Development Corporation members accompanied the party which is understood to have considered the suitability of East Kilbride as a centre for chemical engineering developments.

* * *

Chemical engineering concerns are still worried by an acute shortage of components and accessories which makes it extremely difficult to maintain anything like a regulated delivery of production. Demand is still very strong indeed and there is every indication that both home and export buyers will maintain pressure for some considerable period ahead. The chief anxiety at the moment is the steel shortage. Output is particularly limited by the shortages of such items as electric motors, which prevent manufacturers from even starting production since space considerations generally do not permit the storage of partially completed plant.

Delivery of various components is often delayed for periods of 18 to 24 months, with the result that ultimate delivery date for the finished equipment can be only a matter of speculation. Another problem with which some engineering concerns are increasingly confronted is the tendency abroad to reduce imports, although there is rather less fear of this where capital goods, such as machinery or chemical plant, are concerned. There seems to be a tendency to take the maximum available supplies of this type of plant and equipment in order to develop the home industries in those countries with a view to dispensing with the need for finished imports.

* * *

Staggering of working hours in the heavy engineering industries has been successfully demonstrated on the evidence of the first week's working, Saturday morning attendances in chemical engineering works being even higher than on normal working days.

It is the undoubted intention of the Regional Board to overhaul all the schemes now operating, and to enforce staggering where it has not been accepted voluntarily. Had the engineering industries proved "difficult" the Regional Board's task would have been rendered more difficult. It is believed in Glasgow that the Board will achieve a complete survey by January and that chemical firms not at present staggering or achieving the desired economy will be made to comply with compulsory schemes.

Among new companies registered here last week is Caledonian Plastics, Ltd., general electrical engineers, etc., of 70 Constitution Street, Leith. The company's nominal capital is £1000.

* * *

Many industrial concerns expect a more rigorous control over river pollution to result from the publication of the report of the Committee on Estimates, in which reference was made to river pollution in Scotland. Evidence showed that there was no adequate preventative control in Scotland comparable with that of England. Industrial concerns including paper works, chemical works and other concerns were using rivers solely as the most economic method for disposing of effluents. There is little doubt but that a far greater critical attitude is developing among local authorities, and that firms will no longer be permitted to pollute rivers or sea areas with impunity.

* * *

Plans have been completed for the revival of the slate quarrying industry on the islands of Seil, Luing, and Easdale, off the West Coast. The industry has suffered from competition by concerns nearer to the main centres of population—mainly the quarries of Wales—and because of the development of synthetic roofing products which has largely replaced slate on many housing schemes. The advent of cheap power to the West Highlands and eventually throughout the whole of the Highlands has rather altered this position, and has placed the Scottish slate industry once again in a position where it can compete with other slate industries and competitive roofing materials.

Official Notices

Admendments to Poison Rules

The Home Office has announced that it is intended to amend the Poison Rules, 1947, of the Pharmacy and Poisons Act, 1933. A copy of the intended amendments may be obtained from the Under Secretary of State, Home Office, Room 132, St. Stephen's House, Victoria Embankment, London, S.W.1. Any representations in regard to the amending rules should be addressed to the Under Secretary of State, Home Office, St. Stephen's House, Victoria Embankment, London, S.W.1, not later than November 24, 1947.

Non-Ferrous Scrap

The Ministry of Supply announces that brass scrap 70/30 ingot is now available from Government stocks at a price of £104 10s. 0d. per ton ex works.

Chemical Export Targets

INDIVIDUAL export targets for fine chemicals and pharmaceuticals were the subject of discussion by manufacturers and the Government departments concerned at a meeting last week in London. This meeting was a sequel to the announcement in September by the President of the Board of Trade to representatives of the chemical industry of the export levels he hoped to see attained.

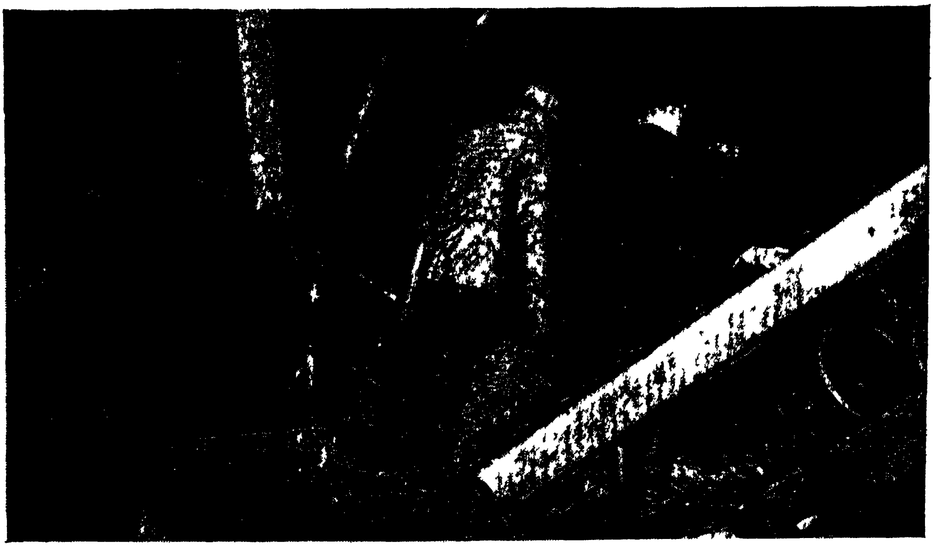
The Government departments at last week's meeting were the Ministries of Supply and Health and the Board of Trade (Raw Materials Department, Industries and Manufactures Department, and Export Promotion Department); and industry was represented by members of the Association of British Chemical Manufacturers, the Wholesale Drug Trade Association, the Pharmaceutical Export Group, the Proprietary Association of Great Britain and the Proprietary Remedies Export Group, and the British Animal Medicine Makers' and Allied Traders' Association. The trade unions were also represented.

The importance of ensuring the provision of supplies for the maintenance of the health of the community was stressed, and it was recognised that this was the first charge on output. The difficulties facing the industry in expansion of export trade were discussed, and the departments concerned undertook to afford all practical assistance in this connection. A further meeting will be held in two months' time.

BENZENE EXPLOSION COSTS THREE LIVES

A VIOLENT explosion was felt throughout a large area of East London in the early evening of Friday last week when an accumulation of benzene vapour ignited at the chemical works of Messrs. A. Boake Roberts & Co., Ltd., Stratford, E.15. The fire which followed blazed furiously for two hours before it was brought under control by the N.F.S. Three operatives—Sidney Rounds, Walter W. Holmes and Robert C. Bushby—lost their lives. A number of other men received injuries.

Serious damage was confined to the actual plant in which the explosion and fire occurred, leaving wreckage equivalent to that of a high explosive bomb. THE CHEMICAL AGE is informed that adjoining plants which received slight damage will soon be in operation again.



Graphic evidence of the destructive effect of the blast is supplied by this view of the wreckage at the Stratford factory secured as soon as the fire service had extinguished the blaze that followed the explosion

COMPANY MEETING

Powell Duffryn, Ltd.

Future Prospects

THE Annual General Meeting of Powell Duffryn, Limited, was held in London on October 22, Mr. Edmund L. Hann, chairman and managing director, presiding. The following is an extract of his statement:

The business of Cory Brothers & Co., Ltd., in Egypt, which has been merged in that of Tractor & Engineering Co., S.A.E., is working smoothly and profitably.

Stephenson Clarke, Ltd., has, in association with other well-known shipowners, extended its shipping interests through the formation of Coastwise Colliers, Ltd. Losses of tonnage through enemy action are gradually being made good, and it is hoped in the next few years to restore fully the amount of tonnage owned in 1939.

I have to report the appointment of Mr. Robert Foot as a managing director of Powell Duffryn and chairman of its new subsidiary company, Powell Duffryn Technical Services, Ltd., which was formed in March of this year to act as consultants in connection with fuel production, distribution and utilisation. Among other activities it has been commissioned by the British Government, in conjunction with the governments of the colonies concerned, to carry out a full investigation into the coal resources of Nigeria, British North Borneo and Sarawak.

Your company has always been one of the foremost in the field of research. We have retained a substantial part of this side of our organisation. In the course of our research we discovered an entirely new method of producing carbon which, compared with methods now in use, possesses great advantages.

The development of this process has made rapid progress. We have been able to purchase a factory at Hayes, Middlesex, and we have promoted a new subsidiary company—Powell Duffryn Carbon Products, Ltd., with a share capital of £500,000.

The research laboratories at Battersea are being widened in scope and adapted for use as a research organisation capable of conducting original research in a wider field. The name of the research organisation has accordingly been changed to Powell Duffryn Research Laboratories, Limited. (Abridged report.)

Fertilisers from Palestine

(from Our Jerusalem Correspondent)

TWO of the most important soil nutrients required for intensive agriculture—potassium sulphate and superphosphate—are soon to be produced in Palestine on a large scale. A £550,000 plant is now being constructed for Fertilisers & Chemicals, Ltd., a subsidiary company of Palestine Potash, in Haifa Bay, where industrialisation is proceeding rapidly. The capital for the new enterprise has been provided jointly by Palestine Potash, the Palestine Economic Corporation of New York, the African-Palestine Development Corporation and the Palestine Jewish Colonial Association.

The new works, which are to be one of the largest in the land, are being erected on a 75-acre site between the Consolidated Refineries and the Nesher Cement Factory, in the so-called "noxious zone" of Haifa Bay, which is set aside for the location of factories where malodorous processes may be involved. The plant will supply Palestine and the Middle East countries with all the chemical fertilisers they need, and will still have a margin for exports. Raw materials are at present won from the practically limitless resources of the Dead Sea, and are shipped to Europe, mainly to Belgium, for processing. The price of the finished article to Palestine's agriculture is therefore swelled by the heavy freight bill for transport of these important bulk commodities from overseas.

Wide Programme

The first aims of the new company are the production of sulphuric acid, potassium sulphate and superphosphates. Expansion plans include large-scale production of dicalcium phosphate for use as fertiliser and cattle food, hydrochloric acid and other basic chemicals and mixed fertilisers. The method of production worked out by the engineers of Palestine Potash has been successfully tested at a pilot plant at the northern end of the Dead Sea. The factory's blue print includes the provision of a railway siding for convenient transport within the country and to neighbouring States, all of which at present import their chemical and fertiliser requirements from Europe.

Already under construction, the works are expected to begin production before the middle of next year, when about 120 persons will be employed. The greater part of the machinery which was ordered in Britain and America in 1945 and 1946 has already been delivered.

Mr. M. A. Novomeysky, the managing director of Palestine Potash, is the chairman of the new company.

COMPANY REPORT

THE DISTILLERS COMPANY, LTD.

THE 70th annual general meeting of the Distillers Company, Ltd., was held in the North British Station Hotel, Edinburgh, on Wednesday, October 15, 1947, when, in the absence of the chairman, the deputy chairman, Mr. H. J. Ross, presided.

The deputy chairman said: The chairman has asked me to express to you his apology for not being present here to-day. Lord Forteviot has been ill for some months, and while his condition is improving, he is not sufficiently recovered to preside at this meeting. I am sure I shall be interpreting your wishes in proposing that we send, from this meeting, a message of sympathy and encouragement, and, at the same time, convey to him our best wishes for a speedy recovery to normal health. In these circumstances it falls upon me as deputy chairman to submit to you the chairman's address.

It is with deep regret that the board records the loss of a colleague, Mr. Alfred Horsfall, who died on October 20, 1946. Sir Vyvyan Board retired from the board as from January 1, 1947, with the view to continuing his work in the government service. The appointment by the board of Mr Alfred Adams as a member of the management committee took place on September 19, 1946. On September 19, 1946, Major C. J. P. Ball, Mr. T. F. A. Board, Mr R. S. Cumming and Mr. C. F. Merriam were appointed directors, and you will be asked to confirm their election.

Trading Results

Turning now to the statement of accounts you will find that the consolidated statement of profit covers a period from varying balancing dates of the parent and subsidiary companies to March 31, 1947. To comply with the new company legislation the board decided to fix March 31 as the balancing date for all the companies, and as a consequence the figures in the accounts are not comparable with those for the year to May 15, 1946. The manufacturing and trading profits, after making provision for Excess Profits Tax, Profits Tax and overseas taxations works out at £7,638,059, but while the profits of the parent company are included for a period of 10½ months, certain subsidiaries contributed for a full year, and a few for fifteen or more months. From an investigation of the accounts it is estimated that for a period of 12 months the profits approximated to £7,100,000, comparing with the corresponding figure of £6,914,330 for the year to May 15, 1946.

To the profit figure of £7,638,059 is added (1) revenue from investments and other miscellaneous receipts £907,333 and (2) provision for taxation made in previous years proved to be not required and now released £395,000, making the total revenue £8,940,392. After making full allowance for income tax on these profits, all necessary provisions and adding to superannuation and sundry reserves in the books of subsidiary companies, there remains £3,428,719 as the sum available to the Distillers Company, Limited. This compares with £2,574,760 for the year to May 15, 1946. In addition, however, it should be noted that the amount applicable to the Distillers Company, Limited, but retained by the subsidiary companies is £190,728 as compared with £103,920.

The board decided to appropriate and to apply to general reserve the sum of £1,100,000 (making it £6,000,000), leaving available with the amount brought forward, and after deducting directors' fees, compensation to directors for loss of office and the interim dividends, the sum of £1,181,364.

It is proposed to pay a final dividend on the ordinary stock of 2½ per cent less income tax (making 22½ per cent less income tax for the 10½ months period) and a special dividend on the ordinary stock of 2½ per cent less income tax, thus leaving to be carried forward the sum of £768,153 as against £591,654 brought in.

Important Acquisitions

During the period under review the company purchased from the Custodian of Enemy Property the 95,000 shares in British Industrial Solvents Limited, formerly held by German interests, making that company thereafter a wholly-owned subsidiary.

The company also purchased the issued share capital of Gilmour Thomson and Co., Ltd., blender, etc., Glasgow, and is carrying on the business.

In November of last year the company acquired the unissued capital of National Chemical Products, Ltd., Johannesburg, South Africa, amounting to 64,850 ordinary shares of £1 each. The terms of the arrangement provide for the acquisition of further shares to enable the South African company to undertake certain new developments now under consideration. National Chemical Products, Ltd., are distillers of industrial alcohol, and have a well established business in solvents and carbon dioxide.

A further investment made by your company, jointly with British Xylonite, Limited, in the proportions of 60 and 40 per cent respectively, was the purchase of the unissued share capital of Lansil, Limited, consisting of 203,367 ordinary shares of £1 each and 514,000 deferred shares of 1s. each.

Investments in British government securities have risen by a little over £1,200,000 to £17,353,626. The holdings are reasonably "short dated" and a revaluation at March 31, 1947, disclosed a market valuation of £17,712,734. As will be explained later, round about £7,500,000 of these holdings has been earmarked for developments in the chemicals and plastics sections of the company, while over £4,000,000 may go to the group pension scheme now under examination.

The consolidated statement of assets and liabilities discloses that while current assets amount to £54,247,421, current liabilities and provisions total £9,018,961, a surplus in this respect of over £45,000,000. This is proof of the great financial strength of the organisation, and it must be remembered that the fixed assets are included at low valuations.

The surplus applicable to the members of the Distillers Company, Limited, exclusive of the reserve for taxation on earned profits but not yet due, has increased to £20,669,907. The issued share capital is £17,225,847 including £2,200,000 of preference stock. As announced at the previous meeting, the board had given careful consideration to this aspect, but it was not possible to obtain permission to re-organise the capital structure.

The board has decided, however, that the time had arrived to place before the members their proposal to make the ordinary stock transferable in units of 4s. each instead of £1 units as at present. You have been asked to attend an extraordinary general meeting to be held immediately after this meeting, when full consideration may be given to the board's proposal.

Distilling

The Ministry of Food continues to exercise control of the production of potable whisky. As indicated to the meeting last year, the quotas out of the 1945 allocations of cereals were completed by the malt distilleries in June and the grain distilleries in September, 1946. In February and April 1947 the industry was granted allocations each of 50,000 tons, while in August further licences amounting to 75,000 tons were issued. This is equivalent in all to about 55 per cent of the pre-war production. These welcome releases were not made by the government without conditions. The Ministry would only grant licences to manufacture new whisky on the undertaking by the industry to increase exports of matured whisky to "hard currency" markets.

Yeast

The company's three yeast factories have been fully employed during the period. The production of the main product, bakers' yeast, continues to meet an increasing demand at home and abroad. The sales of yeast products—covering vitamin B_h1, invertase yeast and concentrate, ergosterol, medicinal, dried autolysed and food yeast—also show satisfactory progress.

Industrial Group

During the period under review the company expanded its industrial activities and put in hand the important extensions to which reference was made at the previous meeting. These extensions broadly cover a large increase in the manufacture of solvents, plasticisers, acetic acid and anhydride at the Hull works of the subsidiary company, British Industrial Solvents, Limited, and involves an outlay of about £2,000,000. In addition, a reorganisation of our plastics group has been carried out with the view of centralising and increasing our manufacturing operations at Barry, South Wales. New plants for our subsidiary companies, British Resin Products, Ltd., and British Geon, Ltd., are in course of erection to produce a range of synthetic resins, adhesives, moulding powders and compounds. The cost of these extensions will also approach £2,000,000.

The company has recently reached agreement with the Government for the purchase of the penicillin factory at Speke, Liverpool, which you will recall was erected and operated by the company as agents for the Ministry of Supply. It is proposed to operate this new development through a subsidiary company to be formed with a capital of about £1,000,000.

An important development which falls to be reported is the provisional agreement between your company and the Anglo-Iranian Oil Company, Limited, to erect a large plant for the production of chemicals from petroleum. Broad details of this scheme have already appeared in the Press, and stockholders will recall that last year reference was made to the need to provide alternative raw materials to serve as a basis for a number of our chemical products, and at the same time permit of the broadening of this range of materials by new ones, which should find a ready market within the United Kingdom and for export. The capital required for this project will be of the order of £5,000,000 which will be subscribed equally by the two companies. Subject to the approval of the authorities it is proposed to establish this joint venture at Grangemouth, in close proximity to the oil refineries of the Anglo-Iranian Oil Company. It will be appreciated that under present conditions a considerable period must elapse before this scheme can be completed, but, in view of the company's existing commitments in the chemical and plastic fields, your directors are satisfied that on a long term view this development is sound and necessary. It should greatly strengthen the country's position in these particular markets and effect a substantial saving in dollar currency.

The report was adopted.

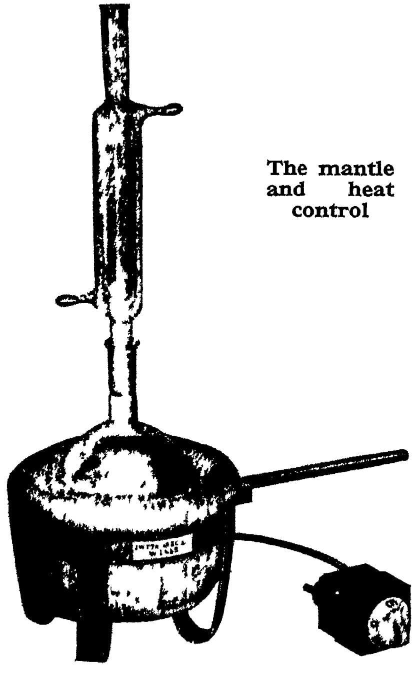
Safe Heating

Device for Inflammable Liquids

A USEFUL simplification of the problem of heating inflammable liquids is afforded by a new heating mantle which can be used to replace oil baths and open heaters and provides accurately controlled electric heat. These "Isomantles" consist essentially of an insulating container lined with glass cloth into which is woven a nichrome heating element, so spaced that about two-thirds of the wattage is dispersed in the lower half of the heater. A thick layer of glass wool is used for insulation between the heating element and the outer glass cloth jacket.

Temperature control is provided by a 3-pin plug unit which gives continuously-variable control from zero to maximum.

For holding the heating mantle, there is an aluminium support which is fitted with an extension rod. Thus the mantle may be placed on a bench or clamped to a retort stand. Electric heating mantles are particularly useful for fractionations of inflammable liquids where exact control of the heat input is necessary, and for distillation of high boiling point materials as temperatures up to 300/350°C. can be obtained and controlled. The large surface heating area eliminates "bumping." The makers of these new aids in laboratory work are J. W. Towers & Co., Ltd., Victoria House, Widnes



The mantle and heat control

Viscosity Measurement

New Electronic Timer Perfected

VISCOSITY measurement is of prime importance to many industries—notably paints and lacquers, oil, asphalt and related chemical industries—and a new electronic timer has been developed at the U S. National Bureau of Standards to make the job easier. The new timer, adapted for use with a falling-ball viscometer in the study of the rapidly changing viscosity of an opaque fluid, was designed by P. J. Franklin and consists of pulse sharpening and trigger circuits. The passage of the ball through two coils around the viscometer is used to trigger a radio frequency oscillator, starting and stopping a timing device

The new electronic timer, seen on the right, is coupled to the two coils encircling the viscometer tube within the constant-temperature jacket. The inductance of the coils is charged as a steel ball falls through the test liquid.

The electronic timer was designed for repeated measurement of the viscosity of an opaque liquid held within a limited temperature range. At present most methods of determining viscosity are based upon a rate of flow through a capillary tube or through a small orifice or depend upon the rate of rotation of a cylinder or paddle wheel within a cup containing the liquid. None of these procedures seemed well adapted to temperature control or practical for measuring viscosity of an opaque liquid, and it was decided that the falling-ball apparatus was the most suitable for this application.

While various electrical methods employing the conductive or magnetic characteristics of the falling ball had previously been used to measure its time of travel, none of these methods was considered completely satisfactory, due to lack of sensitivity, poor reproducibility of results, or the complicated nature of the circuit required. The induction method used in the timer seems to be the answer to the problem, permitting a measurement of time of fall reproducible within 0.01 sec. for a fall time of 2.5 sec.

PERSONAL

Dr. F. A. Todd has joined Messrs. Genatosan, Ltd., as production manager.

Mr. J. Frisken has received the appointment of works manager at the Immingham (Lincs) factory of Messrs. Fisons, Ltd.

Mr. G. C. R. Eley has been appointed deputy chairman of British Drug Houses, Limited.

Dr. E. D. Kamm has been appointed to the board of I.C.I. (Plastics), Ltd. He has been in the company's service for almost 20 years.

Mr. William Eccleston has retired from the post of chief chemist to the Calder & Mersey Extract Co., Ltd., after 45 years' service. His successor is **Mr. F. B. Hobson**.

Dr. H. V. Walters, chief physicist of Dufay - Chromex, Ltd., who has been appointed British Council (Science) Officer for China, left this country on October 16 He will work with Dr. R. A. Silo, the Director of the British Council's science office in China. Dr. Walters, who is 30, obtained a B.Sc. in 1938 at the Imperial College. He joined Dufay-Chromex in 1941.

Arnold H. Smith, acting managing director of Monsanto (Australia) Pty., Ltd., has been elected vice-president of the board of directors of Monsanto (Canada), Ltd., and will assume his duties on January 1, 1948. The appointment is consequent upon the resignation of **Mr. Irving C. Smith**, promoted to assistant general manager of Monsanto's Western Division, with headquarters at Seattle, Washington.

Mr. Frederick Bell, distributing engineer to the Liverpool Gas Company, is the new president of the Manchester District Association of Gas Engineers; he was formally installed on Saturday last. Mr. Bell returned this week from the U.S.A. where, in addition to studying problems of distribution, he has been telling America about the only automatic gas distributing system in this country, which he controls for the Liverpool Gas Company.

British " Pet-Chem " Directors

The first directors of British Petroleum Chemicals, Ltd.—the new company recently formed by the Anglo-Iranian Oil Co. and the Distillers Company for the production of chemicals from petroleum—have been announced as follows :

Mr. Robert Crichton (Scottish Oils, Ltd.) ; **Mr. James A. Jameson**, **Mr. F. G. C. Morris**, and **Mr. N. A. Gass** (Anglo-Iranian directors) ; **Mr. T. F. A. Board**, **Mr. L. A. Elgood**, and **Mr. C. G. G. Hayman** (Distillers directors) ; and **Mr Eric Stein** (British Industrial Solvents).

Mr. John Lewis, who at 34 is an M.P. and managing director of Rubber Improvement, Ltd., as well as president of the National Reclaim and Allied Rubber Trades Association, is engaged to be married to Miss Joy Fletcher, of London.

Mr. George Steedman, chemical manufacturer, of 19 Thorn Road, Beardens, Glasgow, has died.

U.S. Atom Appointments

Appointments of three top - ranking scientists as key personnel at Brookhaven National Laboratory in Upton, Long Island, N.Y., north-eastern centre for research in the fundamentals and beneficial applications of atomic energy, were announced last week in New York.

Dr. Leland J. Haworth has been named as assistant director in charge of research projects. Prior to his present appointment, Dr. Haworth was a professor of physics at the University of Illinois. From 1941 to 1946, on leave from the University of Illinois, he was a specialist in radar development and nuclear physics at the Radiation Laboratory of the Massachusetts Institute of Technology, Boston. In research, he has specialised in the energy distribution of secondary electrons, extremely low temperatures, electronics and nuclear physics.

Dr. Leslie Frederick Nims, who has been appointed chairman of the Department of Biology, comes to Brookhaven from Yale University, New Haven, Connecticut, where he was associate professor of physiology. He investigated the thermodynamic properties of salt solutions, the ionisation constants of weak acids, and the hydrogen ion concentration in living systems.

The third appointment announced is that of **Dr. Thomas Hope Johnson** as chairman of the Department of Physics. During the war, Dr. Johnson was with the Ballistic Research Laboratory of the Ordnance Department at Aberdeen, Maryland. He was also an official investigator and a section member of the National Defence Research Committee from 1940 to 1942, after which he became chief physicist and associate director of the Ballistics Laboratory. After the war, he was sent to Germany on a special mission for the Ordnance Department of the U.S. Army. At present, he holds the post of chairman of the Panel on the Upper Atmosphere for the Joint Research and Development Board. He is a fellow of the American Physical Society and a member of the American Geophysical Union.

Obituary

Mr. F. J. Griffin, formerly a director of Avondale Tinplate Company, has died at Monmouth, aged 79.

PROGRESS IN FACTORY SAFEGUARDS

BRITISH AND AMERICAN PRACTICE CONTRASTED

MANY fundamental aspects of the problem of raising the margin of safety in factory operations were reviewed by authorities at the industrial sessions of the recent Safety Congress in Brighton which marked the silver jubilee of these congresses arranged by the Royal Society for the Prevention of Accidents.

Of more than usual interest were the studies of safety standards in American factories provided by Mr. L. N. Daguid, H.M. Superintending Inspector of Factories, and Mr. R. E. Tugman, Divisional Safety Officer of Imperial Chemical Industries, Ltd. (Alkali Division), who had lately toured U.S. factories to study what standard of safety had been attained and what useful principles they had to teach. The conclusion that can be reached as a result of those studies is that safety standards in British factories are, as a whole, higher than the general standard in America.

Contrasts

Mr. Duguid said that only a few states—notably New York and California—had safety legislation comparable to that in Great Britain. Other states either had very little legislation or else had laws which were not well enforced.

In New York State, which was one of the best, the state inspectors had power to order a machine to be stopped immediately if they considered it unsafe to use. In New Jersey, on the other hand, the inspectors had no power to enter a factory except on the invitation of the occupier.

America had nothing to teach us about the fencing of machinery. Such obvious hazards as shafting and gears were guarded, but "point of operation" guarding was badly neglected. Lifts and hoists in factories were poorly guarded, although America prided herself on her lifts.

Dust and fume removal in American factories was good, but general factory ventilation was not. Air-conditioning systems, for which America was well known, were found in trains, cinemas, shops, hotels and other places where there were customers to be satisfied, but there were very few to be seen in factories.

Better than in U.K.

Mr. Tugman said that he went to America to learn what he could about safety methods and therefore visited only the best factories. What he had seen was not necessarily typical of American industry as a whole, but he was satisfied that the best results achieved in America were better than the best results achieved in Great Britain. Making all allowances for different methods of calculation, he had come to the conclusion that in the best American works the accident rate was only one-quarter of the lowest figures recorded in this country.

One reason for this was that, in the best firms, the drive from the top was more apparent than in Great Britain, and there seemed to be a greater emphasis on managerial responsibility for accident prevention. More staff was employed to encourage, co-ordinate and advise on safety at all levels of management.

Personal contact between foremen and men seemed to be one of the most important planks in the safety platform. The foremen in American industry did not occupy quite the same place as in this country, and the number of men for whom a foreman was responsible seemed very small compared with the large number he often supervised over here.

On the subject of protective clothing we had not much to learn from the U.S.A.; guarding of machinery was not practised to nearly the same extent as in this country.

£1 Million for Uranium Ore

Britain is understood to have purchased from the Belgian Congo last year 2600 tons of uranium ore at a cost of over £1 million. Purchases by the United States—according to information secured by the *Yorkshire Post*—were 3653 tons, valued at about £332,000. Before atomic use of uranium began, practically the whole of the Congo ore output went to Belgium for the production of radium. Output is stated to have risen from 1500 tons in 1939 to 9966 tons in 1945, when the first atomic bomb was made. The price of the ore is some 30 times as high as two years ago.

Coal and Chemical Prices

Chemicals and oils were affected more intimately than almost any other production group by the rise in coal prices, of which the pithead cost was increased on September 1 by 4s. per ton. This is itself the largest individual increase recorded in the review of wholesale prices in September appearing in the current *Board of Trade Journal*, which shows an overall increase in wholesale prices of 0.6 per cent between August and September. The rise in coal prices is outstanding—from 244.2 per cent in August (1930=100 per cent) to 266.3 per cent in September.

Home News Items

Dinner Cancelled.—The dinner which the National Lubricating Oil and Grease Federation was intending to hold at Grosvenor House, London, W, on November 5, has been cancelled.

Open-Cast Oil-Shale Mining.—Production of oil shale by open-cast methods, which began to take shape in July of last year at Fife, now amounts to about 15,000 tons a month. Output per worker is said to be 30 tons daily as compared with 5-6 tons from deep mining.

Dunlop's Production Record.—During a recent visit to Fort Dunlop, Mr. Herbert Morrison congratulated the company's employees on their achievements in beating all previous records for the production of mixed rubber, and giant and tractor tyres. "A very fine record indeed," he said.

APV Acquire Paramount Alloys.—To meet their increasing requirements in stainless steel castings the Aluminium Plant and Vessel Co., Ltd., Wandsworth Park, London, S.W.18, have purchased the business of Paramount Alloys Ltd., Slough, and will operate it as an independent subsidiary.

Fire at Chemical Stores.—Fire extensively damaged the chemical stores of Messrs. Potter and Clarke at Gardiner's Lane, Dublin, last week. Inflammable goods in the store made the work of four sections of the Dublin fire brigade difficult, but the outbreak was eventually brought under control. A number of families in houses nearby were temporarily evacuated because of the possibility of explosions.

8000 Fewer at Work.—A drop of approximately 8000 in the working population, despite a reduction of 9279 in the number unemployed, is shown in a summary, as at September 15, prepared by the Ministry of Labour. Of the total working population of 20,146,000, the number of men (14,426,000) increased 6000 and of women (5,720,0000) decreased by 14,000. Industry employed 12,844,000 men, 52,000 more than in July.

Coal Figures Still Rising.—The rise in coal production lately recorded has been continued. This is recorded in the Ministry of Fuel's summary for the week ended October 18, when the total was 4,049,000 tons, of which 255,200 tons was from open-cast workings, comparing with a total of 3,893,700 tons in the week ended October 12 last year. A total of the first 42 weeks of this year shows production was 155,746,100 tons compared with 150,995,300 tons in the same period last year.

Atomic Energy Exhibition.—The mobile atomic energy exhibition, to which reference was made in a previous issue, is to open at Liverpool on November 6. It will later be transferred to Chester where it can be seen on November 10.

Anti-Friction Metal Recognition.—"Eel" brand nickel-hardened anti-friction metal, which is produced by Messrs. Murex, Ltd., has been recognised by Lloyd's Register of Shipping as complying with the high standards accepted by that body for use in ships' machinery.

Fire Extinguisher Standard.—A British Standard for portable fire extinguishers of the gas/water-pressure type (riveted construction) (B.S. No. 1382), has just been issued and is obtainable from the British Standards Institution, 28 Victoria Street, S.W.1, price 2s., post free.

Non-Ferrous Metals Directorate (Disposals) Address.—The Ministry of Supply announces that from October 20, 1947, the address of the Non-Ferrous Directorate will be 2 Hyde Park Street, London, W.2, instead of 31-43 Norfolk Square, London, W.2. (Ambassador 1290). The telegraphic address remains Metrol, Padd, London.

Farwig Outing.—Employees of J. F. Farwig & Co., Ltd., manufacturers of tins and capsuling machines, recently went on an outing by coach to Brighton. After lunching at the Old Steine Restaurant, the party heard an address of welcome by the company's chairman, Mr. E. D. Warren.

Bibby & Sons Acquisition.—An area extending to six acres at King George V Docks, Glasgow, is to be sold by the Clyde Navigation Trust to Messrs. J. Bibby and Sons, Ltd., cattle feeding stuffs and soap manufacturers. The company had considered acquiring premises at Renfrew, but owing to height restrictions imposed by the Ministry of Civil Aviation in the vicinity of Renfrew aerodrome, had to look elsewhere.

Research Laboratory Gutted by Fire.—A large research laboratory in the Department of Organic Chemistry at Liverpool University was gutted by fire on October 10. The laboratory is one of several and the work of the department will not be seriously affected. Owing to the large quantity of water used in extinguishing the fire, some of which seeped through to another floor, a second laboratory below had to be temporarily evacuated. Damage runs into thousands of pounds, and students have lost valuable books and records of experiments. The cause of the fire is unknown.

Overseas News Items

Swedish Sulphite Plant for India.—A Swedish sulphite manufacturing firm has sold its plant to an Indian concern for erection at Calcutta.

Australia Bans U.S. Periodicals.—In order to save dollars, Australia has temporarily suspended imports of all American periodicals either in bulk or by single subscription.

German Potash for Canada.—During the first six months of the current year Canada imported potash from the Soviet Russian zone of Germany to the value of 263,000 dollars.

Marine Mishap.—Aniline fumes released when a typhoon smashed containers in the British vessel *Eurypylus* killed a seaman. Six others who inhaled fumes are under treatment in Hong Kong.

Fertilisers From Atomic Plant.—According to Mr. H. Wallace, former U.S. Vice-President, the atomic energy plant at Oakridge, Tennessee, will soon produce large quantities of fertiliser as a by-product.

Shell's New Glycerine Plant.—The Shell Corporation of America plans to produce synthetic glycerine at a new plant in Houston, Texas, where production is to start early next year.

U.S. Lacquer and Paint for Sweden.—In spite of the handicap imposed by the dollar shortage, the United States is reported to have replaced Germany as the leading supplier of lacquer and paint in the Swedish market.

Dutch Chemical Expansion.—The municipal authorities of Rotterdam are reported to have under consideration an application for a site from Bataafsche Petroleum Mij., a member of the Royal-Dutch-Shell group, for the erection of two chemical factories.

"Artificial Quartz" in U.S.A.—The Bell Telephone Company is reported to have developed a substitute for natural quartz. It is designated "EDT," which is abbreviation for ethylene diamine tartrate. This product is to be manufactured in a special plant at Pennsylvania.

New Soviet Companies in Germany.—The Moscow State Company for precision machinery, "Totschmasch," has established a branch at Erfurt with a share capital of 100 million roubles. The Moscow State Company for the rubber industry has also established a branch there with 20 million roubles as share capital. Other branches are being set up at Erfurt by the fertiliser company "Kali," the companies "Kainit" and "Silvinit" with a share capital of 100 million roubles each.

New York Chemical Exhibition.—The 21st Exposition of Chemical Industries will be held in New York at the Grand Central Palace during the week December 1 to 6.

Copper for Germany?—A Duisburg copper-smelting company is reported to be negotiating with the Rio Tinto Company for supplies of raw material.

Chile Rations Coal.—As a result of the recent wave of strikes in the Chilean coal-mining industry, stocks have become so depleted that President Videla has ordered a nation-wide rationing of coal.

Blast Furnace Record.—The six blast furnaces of the U.S. zone of Germany are reported to have achieved a total output of 28,500 tons in September, the highest monthly figure of the occupation period.

Holland/French Zone of Germany Trade Pact.—Chemical products figure in a list of goods to be sent from the French zone of Germany to Holland under the terms of a recently concluded agreement.

Chlorine River Transport in U.S.A.—The chemical division of the Pittsburgh Plate Glass Co. is reported to have introduced the transport of liquid chlorine by tank barges on the Mississippi and Ohio and on their tributaries.

U.S. Fertiliser Production.—In the 1947-48 season, U.S. fertiliser industry intends to manufacture only 17 million tons of products instead of the 20 million tons, of which it is capable. This under-capacity programme is said to be due to shortage of transport.

Canada to Exploit Iron-Ore?—Increasing attention is being given in Canada to the exploitation of the Quebec-Labrador iron-ore deposits which are said to contain proved ore reserves totalling about 100 million tons. It is thought that another 200,000,000 tons exist.

Formosa Camphor Industry.—The National Resources Commission of the Chinese Government is attempting to rehabilitate the Formosan camphor industry which formerly supplied nearly three-quarters of the world's needs. The industry is said to be at a complete standstill at the moment.

Argentina/Italy Trade Agreement.—Under the terms of a commercial agreement signed in Buenos Aires last week, Argentina will supply Italy with surplus commodities including 10,000 tons of linseed, 25,000 tons of edible sunflower oil, and 25,000 tons of hogs lard. In return, Italy will send manufactured goods including rayon and industrial machinery.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

INERTOL CO., LTD., Hull, chemical manufacturers. (M., 25/10/47.) Sept. 15, £4500 mortgage, to R. W. Baird, Harrogate; charged on factory at Courtney Street, Hull. *Nil. April 18, 1946.

ANGLO-AMERICAN NITROGEN CO., LTD., Leicester. (M., 25/10/47.) Sept. 19, £2000 mortgage, to J. H. Main, Leicester, and others; charged on land adjoining Green Lane Road and Rosebery Street, Leicester, with the offices, hardening shops and other buildings, erected thereon. *Nil. March 22, 1944.

Company News

The nominal capital of **Lankro Chemicals, Ltd.,** Bertcliffe Works, Salters Lane, Eccles, Lancs., has been increased beyond the registered capital of £5,000, by £20,000, in £1 ordinary shares.

The nominal capital of **Barnet Lime Company, Ltd.,** Barnet By-Pass, South Mimms, Herts., has been increased beyond the registered capital of £2,000, by £5,000, in £1 6 per cent cumulative redeemable preference shares.

The Distillers Company, Ltd. announces that it has declared a dividend on the preference stock at the rate of 3 per cent for six months ended September 30, 1947, to be paid on November 15, to stockholders on the register at October 15.

New Companies Registered

Czechoslovak Chemical Works (London), Ltd. (443,283).—Private company. Capital £10,000 in £1 shares. Subscribers: George Lewi, D.Sc., and B. Dostal. Solicitors: Pritchard Englefield & Co., E.C.4.

S. A. Hampton, Ltd. (442,511).—Private company. Capital £10,000 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, medicines, disinfectants, fertilisers, oils, colours, pigments, varnishes, etc. Directors: S. A. Hampton and Mrs. Dorothy C. Hampton. Registered office: 36 High Street, Brentwood.

B. G. Plastics, Ltd. (442,821).—Private company. Capital £10,000 in £1 shares. Directors: G. H. Dowty, A. S. Brewer, J. Gibbons and G. P. Baldwin. Secretary: L. Barber. Registered office: Royal House, Cheltenham.

Tresco Plastics, Ltd. (442,685).—Private company. Capital £3000 in 2250 preference and 750 ordinary shares of £1 each. Manufacturers of and dealers in plastics, manufacturers and manipulators of cellulose acetate and synthetic resins, celluloids, varnish, enamel, pigments, oils, colours, etc. Directors: K. H. Griffiths, and B. H. Brawn. Registered office: 79 Croyland Road, Wellingborough.

Aliput Manufacturing Company, Ltd. (442,700).—Private company. Capital £100 in 100 shares of £1 each. Building trade and industrial research workers for discovering protective treatment for structures, tanks and plant, or for improving industrial processes with special attention to adhesives. Subscribers: M. Striker and H. Barron. Morris Striker is the first director. Registered office: 8 Princes Street, W.1.

Theratronics, Ltd. (442,984). — Private company. Capital £9500 in 9500 shares of £1 each. Designers, producers, manufacturers and distributors of and dealers in scientific apparatus and equipment of all kinds, and in particular electro-medical apparatus and equipment, etc. Directors: Mrs. Florence M. MacPhail, Mrs. Flora Solomon, and W. L. Nicholson. Registered office: 14 Dartmouth Street, S.W.1.

Industrial Metals & Chemicals Company, Ltd. (443,297).—Private company. Capital £1000 in 1000 shares of £1 each Manufacturers, importers and exporters of and dealers in all kinds of metals, minerals, ores and alloys, chemicals, acetylene and all other articles required by metallurgists, welders and gas and electricity undertakings, etc. Subscribers: R. A. Boswell, 25 York House, Turks Row, Chelsea, S.W.3, and P. S. Hawkings. R. A. Boswell is the first director.

Chemical and Allied Stocks and Shares

CAUTION has remained the keynote of stock markets, partly owing to news of the further gold sale to the United States and the general belief that the outlook for industrial shares cannot be assessed prior to the emergency Budget. There is continued talk in the City of a big increase in taxation of company profits and of widespread additions and increases in Purchase Tax. British Funds failed to hold all earlier gains, but there was somewhat better demand for leading industrial shares on the view that recent declines on Budget fears appeared to have been carried too far in some cases.

Imperial Chemicals have been firmer at 45s. 9d., with Monsanto Chemicals higher at 57s. 6d., and Greeff-Chemicals Holdings 5s. ordinary at 15s. remained under the influence of the recent increase in the interim dividend. B. Laporte were 81s. 3d., W. J. Bush 85s., and Glaxo Laboratories strengthened to £18¼. Fisons changed hands up to 64s. 3d., and in other directions, Lawes Chemical 10s. ordinary remained at 13s. The units of the Distillers Co., now in their "split" 4s. form, have been active up to 28s. partly owing to the statements at the recent annual meeting indicating the big expansion in the drug-manufacturing activities of the group. Borax Consolidated deferred were steady at 53s. 1½d., with British Glues & Chemicals 4s. ordinary firm at 18s. 9d. British Oxygen improved to 90s., but at 71s. Turner & Newall failed to hold all of an earlier rally. Lever & Unilever moved up to 49s. 6d. United Molasses have been active around 47s. 6d. awaiting the interim dividend, and in other directions, Triplex Glass 10s. ordinary strengthened to 29s. 3d.

The further news of expansion in steel output kept firmness in iron and steel shares which were generally a few pence higher where changed, United Steel being 25s. 1½d. on consideration of the full results, Guest Keen 47s., Babcock & Wilcox 68s. 9d., while in response to the higher interim dividend, Hopkinsons rose 5s. to £5. Dorman Long strengthened to 25s. 3d., Colvilles to 26s. 1½d., and colliery shares remained firmly held in view of estimates of their ultimate break-up values, which in most cases appear to be well above current market prices. Elsewhere, however, Tube Investments eased to £5 15/16, British Aluminium have strengthened to 44s. 9d., and General Refractories displayed steadiness at 21s.

Textiles were inclined to firm up, it being pointed out that in many cases there would be scope for good increases in dividends in future, even if Profits Tax were doubled, assuming that it is possible to achieve export targets. Bradford Dyers improved to 22s. 4½d., Fine Spinners to 29s. 10½d., while Calico Printers were 21s., and Bleachers 9s. 7½d. Courtaulds transferred around 43s. 7½d. and awaiting the full financial results, British Celanese were 23s. 10½d. Wall Paper Manufacturers deferred fluctuated moderately around 40s. 9d. awaiting the dividend announcement. British Plaster Board were 23s. 6d., and Associated Cement 59s. 9d.

Beechams deferred were little changed at 21s. 9d. following the news that, owing to changed market conditions, the proposed issue of additional deferred to shareholders is to be replaced by a public offer of 1,500,000 new 4½ per cent redeemable cumulative preference £1 shares, shareholders having preferential allotment. Boots Drug were 55s., Timothy Whites 42s. 6d., and Sangers 30s. 6d. Oil shares moved higher on balance, sentiment being helped by the news of further increases in U.S. crude oil prices and by continued reports of a big new issue of capital planned by the Shell-Royal Dutch group. A new private company for the manufacture of chemicals from petroleum has been registered and directors of the Anglo-Iranian and Distillers companies are represented on the board.

British Chemical Prices

Market Reports

THERE have been no changes of importance in the industrial chemicals market during the past week, and the movement in all sections has been of fairly substantial dimensions. Prices generally remain very firm. Supply difficulties continue to restrict activity in the potash chemicals market, and there has been no easing of the position for bichromate of soda. A steady call for the lead oxide has been maintained and formaldehyde, acetone, acetic acid, and barium chloride are items which are in active request. There is little of fresh importance to report in the coal-tar products section. Prices are unaltered with a strong undertone and the demand continues much in excess of available supplies.

MANCHESTER.—The recent stiffening of prices in a number of directions has done nothing to reduce buying interest in both light and medium chemicals. From the point of view of new inquiries, as well as of actual business, a fair amount of activity has been reported on the Manchester market during the past week. Textile bleaching, dyeing and finishing chemicals have been in steady request, and there has been sustained pressure for deliveries of a wide range of products from other industrial users. In the market for fertiliser materials also some sections are fairly busy. In pitch, creosote oil and most other tar products the movement into consumption is maintained at a good level. In the metal market, buying licences for cast-iron scrap having been distributed fairly generously, there is considerable pressure on supplies. All saleable parcels of cast scrap are taken.

GLASGOW.—Fairly busy conditions have prevailed in the Scottish chemical market during the past week, and available supplies of most chemicals have been reasonably well absorbed. There has been no improvement in those chemicals known to be in short supply, such as sodium and potassium salts. In the export market there has been little change, a few orders again being booked. Sterling difficulties continue adversely to affect a number of possible orders.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Urea formaldehyde cashew nut shell liquid reaction products.—Harvel Corporation. Dec. 7, 1939. 20217/1947.

Metallo-sulpho-methyl-phenols. — Harvel Corporation. March 23, 1946. 20218-19/1947.

Polymerisation of unsaturated phenolic compounds.—Harvel Corporation. Feb. 13, 1940. 20220/1947.

Sulphonation products of cashew nut shell liquid and the like.—Harvel Corporation. Sept. 1, 1939. 20221-22/1947.

Preparation of ethers of anacardic materials.—Harvel Corporation. Jan. 30, 1945. 20223-24/1947.

Hydrogenation processes.—Harvel Corporation. March 21, 1945. 20555-56/1947.

Rubber-like compositions.—Harvel Corporation. Aug. 17, 1945. 20557/1947.

Phenol-acetal reaction products.—Harvel Corporation. June 29, 1943. 20560/1947

Compositions comprising synthetic rubber and ancardic materials.—Harvel Corporation. July 27, 1944. 20561/1947.

Laminated products.—Harvel Corporation. Nov. 15, 1938. 20562/1947.

Cashew nut shell liquid furfurhaldehyde condensation products.—Harvel Corporation. July 17, 1940. 20563/1947.

Insecticides.—Harvel Corporation. May 26, 1939. 20566-67/47.

Polymerised chloroprene-cashew nut shell liquid composition. Harvel Corporation. May 26, 1939. 20568/1947.

Preparation of phenolic ethers and esters. —Harvel Corporation. Nov. 28, 1939. 20569/1947.

Phenol aldehyde ether condensation products.—Harvel Corporation. Oct. 10, 1942 20570-71/1947.

Phenolic condensation products.—Harvel Corporation. Oct. 10, 1942. 20572-73/1947.

Insecticides. —Harvel Corporation. Jan. 23, 1940. 20574-75/1947.

Insecticides.—Harvel Corporation. May 26, 1939. 20736-37/1947.

Purification of glycerol solutions.—J. K O. H. Holmberg. Feb. 20, 1946. 1769/1947.

Alloy steel.—Inland Steel Co. Dec. 26, 1944. 7658/1946.

Re-inforcing bars.—Inland Steel Co. May 24, 1944. 20907/1947.

Finishing rolls and method of making same.—Inland Steel Co. May 24, 1944. 20908/1947.

Process for separating components of fluorination reaction mixtures.—Kinetic Chemicals, Inc. Feb. 14, 1945. 20604/1947.

Steel product and method of manufacture.—La Salle Steel Co. April 22, 1939. 20668/1947.

Synthesis of adrenal cortical hormone.—Merck & Co., Inc. July 14, 1945. 19042-43/1947.

Process of producing a dicarboxylic acid derivative of a sulphathiazole.—Monsanto Chemical Co. Sept. 10, 1942. 22342/1945.

Process of an aqueous dispersion for treating fibrous materials.—Monsanto Chemical Co. Aug. 24, 1944. 16902/1946.

Process of making ethylene oxide, and the improved catalyst suitable for use in said process.—Monsanto Chemical Co. Feb. 9, 1945. 23819/1946.

Methods of preserving rubber and the vulcanised rubber product resulting therefrom. —Monsanto Chemical Co. Jan. 14, 1943 20780/1947.

Processes for the production of olefinic chlorhydrines.—Montecatini Soc& Generale Per l'Industria Mineraria e Chimica. Oct. 23, 1941. 20926/1947.

Colloidal solutions of inorganic oxides.—National Aluminate Corporation. April 15, 1940. 20400/1947.

Process of producing rayon.—North American Rayon Corporation. March 7, 1940. 20834/1947.

Manufacture of dyestuffs of the copper phthalocyanine type.—G. M. O'Neal. March 17, 1943. 20473/1947.

Recovery of organic materials.—Permutit Co., Ltd. May 17, 1944. 21057/1947.

Recovery of organic materials.—Permutit Co., Ltd. May 10, 1944. 21058/1947.

Recovery of organic materials.—Permutit Co., Ltd. May 10, 1944. 21059/1947.

Acid triphosphates as builders for alkyl sulphates and other soapless detergents.—Proctor & Gamble Co. Feb. 6, 1941. 21094/1947.

Method of manufacturing sulphurous anhydride.—J. C. Seailles. Jan. 1, 1944. 20481/1947.

Method for making phenol.—Socony-Vacuum Oil Co., Inc. May 24, 1941. 20152/1947.

Production of nitriles.—Socony-Vacuum Oil Co., Inc. June 6, 1944. 20154/1947.

Aminoalkyl derivatives of thiophenes.—Socony-Vacuum Oil Co., Inc. Dec. 21, 1945. 20435/1947.

Method of producing an acid-neutralising medium for peroral employment.—Solusol I/S. Feb. 23, 1946. 5037/1946.

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The Chemical Age

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Telegrams: ALLANGAS FLEET LONDON
Telephone: CENTRAL 3212 (16 lines)

SCOTTISH OFFICE:
116 Hope Street, Glasgow (Central 3970)

MIDLANDS OFFICE:
Daimler House, Paradise Street, Birmingham (Midland 0784-5)

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Science and the Humanities

IN this materialistic age, the study of Greek and Latin, of the gifts of old civilisations long past and the mellow works of our great ancestors is regarded as of small account. There is meanwhile a deal of discussion about education for industry, since the majority of our people are engaged in industry and commerce. On all sides we hear of a shortage of skilled technical men, and an employer asks only to be provided with " bodies "—to use a singularly soulless army term—who shall have assimilated sufficient facts to be granted a degree in some science or branch of technology, and who will then devote that knowledge to industry. There is no demand for *education;* there is an overwhelming demand for *training*. Some educationalists take a broader view, but their voices may be drowned by the clamour for technicians.

Let us admit at once that an education based wholly on the classics is of small use in industry. He who would make his mark, or even earn a competence, must have been trained to a trade or profession. It is the generation of the specialist. The specialist, however, is something of an unbalanced entity. A great deal of the contemporary unrest in the country derives from an unbalanced, materialistic, Marxist attitude on the part of those who should know better. Balance, we believe, can be found only by leavening our essential practical training with a classical education.

Lord Greene, Master of the Rolls, a Hertford scholar who has been Principal of a Working Man's College, has pointed out the dangers of the doctrine being preached that the main, perhaps the only, object of education is to turn a man into a good servant of the State. That is how Nazism functioned in Germany.

In the light of the obvious discontents among the best of our population, Lord Greene pins his faith to the humanities: " In a world where material needs, not of a few but of the whole nation, must necessarily come first—a world in which specialisation and the expert . . . are regarded as providing the only means of salvation for our people—the humanities in education are to be regarded as an indispensable corrective of ill-balance."

If we accept the need for a balanced education, as accept it we must, the question arises how are we to attain the ideal? If it takes eleven years to train a chemical engineer, can he be expected also to be a classical scholar? The question is apposite, but Lord Greene has the answer. Foreseeing that classical learning and scholarship must become the speciality of a devoted few, Lord Greene has come to the conclusion that " the classics, the humanities in the widest sense, and science itself might unite in a determination to provide those elements of a liberal education." He suggests that there should be attached to every school a " humanities master " who should impart the values of the classics and " endeavour to implant in the minds and tastes of his pupils those qualities which the humanities alone can give. . . . His function would be to teach not the classics, but the humanities."

We have been warned; and there is yet time, even for those of us who have qualified without that liberal background, which reading can still provide.

NOTES AND COMMENTS

"Export Only"

IN sharpening the focus of attention upon "exports at all costs," Sir Stafford Cripps, in his most recent national appeal, would seem to have overlooked some vital considerations which we cannot afford to neglect, if we are to survive as an industrial nation. That belief is strengthened by the timely note issued by the Association of British Chemical Manufacturers, reproduced on another page, indicating that there are signs that a too literal interpretation of Sir Stafford's demand that "We must increase exports at whatever cost to the home market" may, in the long run, have results the reverse of what was intended. If "Is it for export?" becomes the indiscriminate touchstone for regulating all supplies to the factories and chemical plants, some of those undertakings will one day be derelict, their potential contribution to the export drive lost and the commercial channels upon which fundamentally all productive industry rests may disintegrate beyond repair. The knowledge then that a proportion of export undertakings have stockpiles fuller than their order books and unlimited supplies of raw materials will be meagre consolation.

German Dismantling

THE new dismantling list for the Anglo-U.S. zone of Germany contains more than 60 chemical factories, but most of these are concerned entirely with the production of explosives and other war chemicals. Dynamit A.G., for instance, is represented with eight factories on the dismantling list (not counting works for the production of ammunition, fuses, etc.), but most of these concentrated entirely on making explosives. Two other Dynamit factories only are on the list: the works at Troisdorf for making nitrogen, Vulcan fibre, celluloid and phenol resins, and the works at Schlebusch for glycerine and T.N.T. These plants, of course, have been selected for their war potential, and the same consideration is responsible for the inclusion of other chemical plants in the dismantling list. Eleven I. G. Farbenindustrie works are mentioned but certain parts only of these will be dismantled. They include the Perlon U plant at Dormagen, the works for cellulose derivatives and various plastics at Elberfeld, the plant for ethyl oxide and ethyl dichloride at Holten, the works for sulfigran, atebrin, various synthetic resins, hydrazine hydrate, activated carbon and toluene nitrate at Leverkusen, for electrolytic chlorine, caustic soda and alkyd resins at Uerdingen, for ethyl oxide, ethyl dichloride, poly-ethylene, and bleaching powder at Zweckel, for liquid oxygen for industrial purposes at Duisburg, the plant for making wax at Gertshofen, the departments for uresin, acetate, carboresin, black sulphur, sulphur, solvents, chlorine solutions, and dinitrobenzene at Hoechst, and the industrial gas plants at Griesheim and Kassel-Mittelfeld.

Keywar Plants

THE G.m.b.H. zus Verwertung chemischer Erzeugnisse is another company represented with a number of factories on the dismantling list; the six works in question were all used for the production of explosives, smokeless powder, nitro-cellulose, and war chemicals. Schickert, Otte & Co. lose two plants for making 85 per cent hydrogen peroxide at Rhum-springe and Bad Lauterberg, and the hydrogen peroxide plant of Elektrochemische Werke, Munich, is also to be dismantled. Several important soap and glycerine factories are on the list in the British and in the U.S. zones, including part of the Henkel & Co. factory at Duesseldorf, the works of Kopp & Co. in Munich, of M. Kappus at Offenbach, of P. S. Mobs at Giessen, of Roehm & Haas at Darmstadt, and of Kraemer & Flemer at Heilbronn. Other chemical works to be dismantled in the Anglo-U.S. zone are: A.G. für Stickstoffduenger, Knappsack (department for making activated carbon and acetone), Oxo-G.m.b.H., Oberhausen (installations for making alcohol preparations), Chemische Werke Harz-Weser, Langelsheim (activated carbon), Anorgana A.G., Gendorf (departments for chlorine and caustic soda, for acetaldehyde, and for glycol), Dr. Alexander Wacker, Burghausen (departments for cellulose acetate resins and for solvents) Chemische Werke V. Bransche & Co., Gersthofen (hydrazine hydrate), Vereinigte Flusspatwerke, Stulln (works for the production of hydrofluoric acid, sodium hydrofluorides, synthetic cryolite, potassium bi-

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fluoride, and sodium silicate), Kalle & Co., A.G., Wiesbaden (installations for making methyl, ethyl and cellulose products), Chemische Werke Kurt Albert, Wiesbaden (departments for phenol plastics and copal resins), Saline Ludwigshall, Bad Wimpfen (sulphur salts, aluminium sulphide, and synthetic cryolite), and Mahler, Esslingen (chemicals).

Lesser Evil

THE dismantling of plant for the manufacture of chemicals chiefly used for war purposes which are also of peacetime use will inevitably involve the German chemical industry in certain difficulties, but these seem to be less troublesome than the shortage of coal and electricity and the obstacles to a smooth flow of production raised by zonal boundaries. During the first half of this year chemicals accounted for 22 per cent of all shipments from the western to the eastern zone and for 12 per cent of all consignments in the opposite direction. They were thus the principal item in inter-zonal trade, more important even than coal and steel. This is largely due to the fact that the production of raw materials for synthetic plastics, fibres, rubber substitutes, and fuel components which played such an important part in German war production of chemicals was geographically tied down to the availabilty of basic materials and power. The zonal frontiers have cut some important chemical plants from their original power and raw materials sources, quite apart from the fact that the supply of coke, coal-tar and other organic raw materials has been severely reduced by the shortage of coal. For thermo-plastic resins, for instance, the Anglo-U.S. zone in consequence now depends on one small plant in Bavaria whose output is less than 10 per cent of the wartime supply in the combined zone. It is argued that the production of synthetic fatty acids, lubricants, rubber and leather substitutes, and fibres could be substantially increased and meet a much larger part of the domestic demand than at present if their raw material intake could be increased. But the problem of raw materials is not the only one. Prolonged idleness has led to the dispersal of labour and deterioration of the technical installations. The recent increase in Ruhr coal production is likely to help to increase chemical production, but the latest output statistics still show big fluctuations and differences between different regions and factories, due to irregular arrivals of fuel and interruptions caused by power cuts and other difficulties.

New Formaldehyde Factory

At least eighteen months will pass before the disused tin-plate works at Mold can be converted for use by a new light industry. This news was given to Mold Urban Council, by Messrs. Synthite, Ltd., who bought the works as a branch factory for producing formaldehyde. Large quantities of water, it was said, were required for cooling purposes, and it has been found that the supply from the River Alyn will often be insufficient. The project now depends on the success of a bore-hole, and results are awaited before proceeding further. Even with a satisfactory water supply, considerable repairs and reconstruction will be necessary before the plant can be installed. A certain amount of local labour will be required for the preparatory work.

A.B.C.M. Warning

Need for Home-Export Balance

BECAUSE of the present overwhelming emphasis on exports, there is a prospect that the essential needs of home manufacturing industries, notably the chemical industry, may be under-supplied, through the misinterpretation of Board of Trade policy on the balance of home and export allocations.

This dangerous trend is the subject of a timely warning contained in the following statement issued by the Association of British Chemical Manufacturers:

Exports First

In his address, at the Central Hall, Westminster, on September 12, on the export drive, to which great publicity was given in the *Board of Trade Journal* and in the Press of the country generally, the then President of the Board of Trade, Sir Stafford Cripps, made the general statement that the first call on industry was to reach its export targets and that what was left after that would be for the home market.

Guidance Needed

Firms not only in the chemical industry but in other industries, apparently in a desire to implement the President's desires and instructions, are now, in many cases, demanding to know whether materials and plant required by firms in the chemical industry are to be used for export and if so, to what extent. This is likely to lead to very serious difficulties unless industry generally is made aware of the later statement by the new President of the Board of Trade, Mr. Harold Wilson, to the effect that the chemical industry is in a special position and that its first duty, speaking generally, is to supply other industries which have been given export targets and the essential needs of the home market, such as those for agriculture and public health, and that what remains after that will be what is available for the export market.

Vital Chemical Plant

In other words, the export criterion mentioned by Sir Stafford Cripps does not operate for raw materials and equipment supplied to firms in the chemical industry as it does to firms in other industries. There are indications that Regional Boards are not entirely appreciative of this distinction, which has also been emphasised by Mr. John Wilmot, the Minister of Supply, when he addressed the Engineering Advisory Council. He made it clear that in the case of certain types of machinery, which included chemical plant, home supplies of which would indirectly make an early and significant contribution to export in the hands of the chemical industry—itself a most important export industry—the country would have to be particularly careful to find the correct balance between home and export.

Chemical Industry Essential

The recent order in regard to the direction of labour may also give rise to misunderstanding, because the chemical industry is not mentioned in it. The purpose of the order was to draw attention to the essential industries which, in general, are seriously under-manned and was not intended to indicate all the industries of the country which are regarded as essential at the present time. The chemical industry is most certainly regarded by the Government as an essential industry, but in general its labour shortage is not great. Unless, however, the position is fully appreciated there is a danger that the Labour Exchanges will direct workers to industries other than the chemical industry, with the result that the industry will be unable to make up its wastage of labour and the deficiencies which already exist and will increase as fresh plant and equipment become available.

It is essential that the Government departments and British industry should have a clear appreciation of the above points and their implications.

(*Continued in next column*)

Export Sales Slump

Copper Sulphate Trade Halved

CHANGING conditions in the export markets which had greatly diminished sales from this country were referred to by the chairman, Mr. J. D. McKechnie, at the 23rd annual general meeting of the British Suphate of Copper Association, Ltd., in London last week. Sales of sulphate of copper, about 90 per cent of which was for export, had been very unsatisfactory, he said. Exports, which in 1945-46 amounted to 52,698 tons were reduced in 1946-47 to 30,103 tons, representing a difference in value of approximately £750,000.

Foreign Plants Starting

The carry-forward of stocks of sulphate of copper shipped by UNRRA to European countries, the restarting of foreign sulphate of copper plants provided with relief copper, and currency difficulties have hindered our sales to European countries.

The association had kept in close touch with the Government and had constantly reminded them that while this country would not consider bi-lateral trading agreements, other countries were busy making such agreements, which would seriously interfere with our exports of sulphate of copper.

Bi-Lateral Trading

Although the outlook for the 1947-48 season was not promising, some hope could be derived from the fact that the Government had now decided that bi-lateral trading agreements may be necessary in order to assist exports, and that the Board of Trade had promised assistance.

More Fats for U.K.

The International Emergency Food Council last week made its recommendations for the 1947 allocations of fats and oils. Under these arrangements, Britain is to receive one of the largest shares. Thirty exporting nations will provide 3,473,000 tons—900,000 tons more than last year's actual shipments—for distribution among 60 importing nations. European nations will, in particular, benefit from the increased quantities now available.

Record Chemical Exports

£788,000 Rise in September

CHEMICALS and associated products contributed materially to the increased U.K. export total in September and the reduction of £18.5 million in the unfavourable balance of trade, which was briefly announced in last week's CHEMICAL AGE. The total overseas sales of chemicals, valued at £3.458 million, represents a record and compares with £2.670 million a year ago. An even greater increase would undoubtedly have been recorded were sodium compounds not still suffering from the limitations imposed by the fuel shortage earlier in the year. Their total is still only half what it was a year ago. In the record of imports there was also a fairly wide tendency to expand, exemplified by items such as caustic and lyes (from 488 to 3858 cwt.), potassium compounds and carbon blacks, of which the last imports were quadrupled in September at 107,000 cwt.

CHEMICAL EXPORTS

	Sept., 1947	Sept., 1946
	Cwt.	Cwt.
Citric acid	241	1,355
Formic acid	1,836	1,660
Tartaric acid	234	366
	Tons	Tons
Aluminium oxide	1,010	6
Sulphate of alumina	2,269	1,248
All other kinds	355	362
Ammonium sulphate	35,267	25,462
Nitrate	5,232	963
	Cwt.	Cwt.
Bleaching powder	43,457	77,640
Calcium carbide	6,119	11,543
	Gal.	Gal.
Benzol	9,198	66,939
Cresylic acid	200,397	196,083
Tar oils	1,172,900	235,258
	Tons	Tons
Copper sulphate	946	1,131
	Cwt.	Cwt.
Disinfectants, etc.	87,996	61,890
Glycerine	343	9,057
Lead acetate, litharge, red lead, etc.	3,402	4,219
	Gal.	Gal.
Tetraethyl lead	83,863	—
	Cwt.	Cwt.
Nickel salts	2,479	2,731
Potassium compounds	4,980	4,986
	Tons	Tons
Salt	13,210	11,360
	Cwt.	Cwt.
Sodium carbonate	243,820	347,264
Caustic soda	97,459	210,297
Chromate and bichromate	—	1,362
Silicate (waterglass)	4,378	22,424
Sodium sulphate and salt cake	16,026	33,151
	Oz.	Oz.
Quinine and its salts	182,001	125,795
	Mega Units	Mega Units
Penicillin	172.042	(Aug. 168,536)
	Cwt.	Cwt.
Coal-tar dyestuffs	18,028	13,509
Extracts for tanning	8,446	14,590
Earth colours	15,993	17,209
Lithopone	5,496	4,149
White lead	1,383	848
Paraffin wax	3,093	41
***Total value of chemical manufactures (excluding drugs and dyes)**	£3,458,414	£2,670,536

CHEMICAL IMPORTS

	Sept., 1947	Sept., 1946
	Cwt.	Cwt.
Acetic acid	9,886	—
Boric acid	4,500	—
Tartaric acid	700	1,400
All other kinds of acid	1,364	1,010
	Tons	Tons
Ammonium phosphate	—	893
Borax	36,600	7,000
Calcium carbide	393	4
Glycerine	155	5
	Lb.	Lb.
Iodine	—	59,571
	Cwt.	Cwt.
Caustic and lyes	3,858	488
Potassium chloride	576,881	165,900
Potassium sulphate	38,340	1,100
All other potassium compounds	2,963	2,350
Sodium nitrate	—	60,136
	Pf. Gal.	Pf. Gal.
Ethyl alcohol	528,478	—
	Oz.	Oz.
Quinine and its salts	119,931	—
	Lb.	Lb.
Menthol	14,884	28,173
	Cwt.	Cwt.
Synthetic organic dyestuffs	1,100	302
Carbon blacks	106,415	25,512
Turpentine	11,262	2,184
Paraffin wax	102,896	32,495
	£	£
***Total value of chemicals, drugs, dyes and colours**	2,243,137	981,673
***Oils, fats and resins**	10,676,396	7,172,629

* *Including some commodities not listed here.*

CHEMICAL MANUFACTURERS FINED

Messrs. Stotherts, Ltd., manufacturing chemists, Atherton, Lancs., were summoned at Leigh Magistrates' Court last week for contravening section 47 (2) of the Factories Act, 1947, in that they caused a stationary internal combustion engine to be used at the factory otherwise than in accordance with the provisions of the Act.

The firm had failed to make provision for the gases from the engine emerging into the open air, and for the engine to be partitioned off to prevent fumes entering rooms where people were working. Seven work people in the factory had recently been affected by fumes. They were fined £5.

Quest for Economic Security

Are Chemists Adequately Protected?

At a meeting of the Manchester Section of the British Association of Chemists held at the Engineers' Club, Albert Square, on October 15, Mr. Norman Sheldon, president of the association, opened a discussion on "Economic Security in the Chemical Profession." The chair was taken by Mr. J. Greenwood, F.R.I.C. Members of other scientific societies were also present and a frank and interesting discussion followed.

Mr. Sheldon began by pointing out that there are in existence organisations to which every chemist should belong, but so many do not join because they do not take the trouble to understand what they are trying to do. They grudge the money for the subscriptions—or they think the particular bodies are playing at politics—or they pride themselves on their individuality and ability to look after themselves, he said. This is the kind of pride that very often goes before a fall. In the long run they and the whole profession are the losers.

A National Body

Mr. Sheldon thought that what was needed first of all was a strong professional association of the highest standing which would only admit as full members those who were fully qualified. That should be the national organisation charged with the duty of ensuring that the courses of training in various parts of the country should produce a steady flow of entrants into the various branches of the profession. Every student of chemistry at a university or technical college who intended to take a full course in chemistry should register as a student at a nominal cost; and such registration should be compulsory.

This association, said Mr. Sheldon, should be supreme in all professional matters and if at any time there is compulsory registration of chemists who are allowed to practice, this should be the registering body.

"We all know," he added. "that we have such an organisation in the Royal Institute of Chemistry, an institution to which I have always been proud to belong, for I joined as a student in 1908 because I was told by the chemist responsible for my training that I must pay my 5s. and register. I can assure you I have never regretted that advice."

Referring to restrictive trade practices, Mr. Sheldon said the professional classes were being squeezed more and more between the millstones of taxation and manual workers' privileges. It must be obvious that by their trade union activities certain groups of people were feathering the nests of their members at the expense of the community. Restrictive practices which did not make sense at all to a scientist were encouraged to a far greater extent by trade unions than any employers' organisation ever dreamt of.

The speaker thought that within the next few years almost every profession, medical, accountancy, law and so on, would have to organise its own union to deal with economic matters on non-political lines. Too many of their members who were formerly in private practice were becoming employees of the state or of big industrial firms. They would form unions which every member would be encouraged to join; indeed it would be found almost impossible to stay outside.

After Mr. Sheldon had discussed at some length such questions as unemployment and sickness in the chemistry profession, a general discussion was opened by Mr. Gartside, who said that he was a pharmaceutical chemist engaged in industry. He said that there were a considerable number of pharmacists with high qualifications and considerable industrial experience who were not catered for by the Royal Institute of Chemistry, and if this continued there would be no place for them in the scheme suggested by Mr. Sheldon. He thought that the scope of the institute should be broadened. Mr. Gartside also suggested that the B.A.C. should make it clear that in addition to the individual benefits offered to chemists they desired to mobilise the strength of the profession in order to create social benefits for the community.

No T.U.C. Affiliation

Mr. Maclaren doubted whether it was necessary to have two separate bodies as he thought the Royal Institute of Chemistry could carry on all the work which the B.A.C. does as a trade union, and Mr. Dickinson asked, whether it was suggested that the "closed shop" principle should apply, as Mr. Sheldon had mentioned compulsory registration of students. In reply to these two speakers, Mr. Sheldon said that in his experience there were many things that could be done by a trade union that could never be undertaken by a properly constituted professional body. The law allows a trade union to take action which might be very difficult and even dangerous for any body not registered as a trade union.

Mr. Tee asked why the B.A.C. was not affiliated to the T.U.C., and Mr. Sheldon pointed out that the reason was a very simple one, the members had voted against it. He reminded the meeting that affiliation to the T.U.C. was certain to label any organisation as having a definite party bias and for this reason, if for no other, he thought it would be dangerous to affiliate.

SULPHURIC ACID FROM SLUDGE

THE Standard Oil Development Co. claim—in Eng. Pats. Nos. 21678-9/47—an improved method for recovery of sulphuric acid from acid sludge.

Methods hitherto used have included hydrolysis of the sludge with water and steam in order to separate it into oil and weak acid and concentration of the acid. Another current method is to heat the sludge to about 550°F. to cause it to decompose into sulphur dioxide, solid coke, water vapour and small amounts of hydrocarbon vapour. The dioxide, after separation, can be readily converted into pure acid of any desired strength. The latter method, however, requires very large quantities of coke and it has been found difficult to maintain a uniform temperature.

Incandescent Coke

The object of the present invention is to regulate temperature and sludge decomposition, as well as general operation. Powdered coke, heated to incandescence, is passed through a pipe into a reaction vessel, with sufficient inert or non-oxidising gas—nitrogen, carbon dioxide, or flue gas—to cause the coke to behave like a liquid. It passes through a grate in the lower part of a cylinder in the reaction vessel. Sludge is introduced into this cylinder and thoroughly mixed with the coke at a controlled temperature of about 550°F.

Decomposition of Mixture

The mixture passing upward through the cylinder decomposes at the stated temperature into sulphur dioxide, steam, and mixture of hydrocarbon and coke. These are removed, after passing through a rotary separator. The coke may be passed again into process and the dioxide and other products are cooled to separate steam and condense out some of the hydrocarbons. The residual dioxide is passed through a furnace, where the fixed hydrocarbons are burnt out, and then used for production of sulphuric acid.

Turbulent Phase

During the process the coke must be maintained in a suspended dense turbulent phase. Portions are continuously removed, and some is introduced into a separate combustion zone, together with an oxidising gas passing upwards through the solids at a rate sufficient to maintain the dense turbulent condition. Part of the coke is consumed in the combustion zone so that a quantity of hot, finely divided coke is produced, some of which is removed from the combustion zone to the coking zone.

ROYAL INSTITUTE OF CHEMISTRY

THE Royal Institute of Chemistry of Great Britain and Ireland announce that the following were successful in the September examinations for Associateship or Fellowship of the Institution.

Associateship in General Chemistry

Robert Ballantyne Adamson, Heriot-Watt College, Edinburgh, and Royal Technical College, Glasgow; Geoffrey Robert Andrews, Central Technical College, Birmingham; Desmond Arthur Boswall, Municipal College, Portsmouth; James Wennington Boyd, Technical College, Sunderland; George Alfred Butcher, Central Technical College, Birmingham; Arthur Cecil Diggins, Municipal College, Burnley; William Douglas Fordham, B.Sc. (Lond.), University College, Leicester; William Charles Garratt, Technical College, Derby; Michael Lister Hall, B.Sc. (Lond.), Municipal Technical College, Hull; Samuel Harrison, City Technical College, Liverpool; Frank Reid Harvey, B.Sc. (Lond.), Municipal Technical College, Bolton; John Edwin Hogan, Technical College, Coventry; Crosby Walker Humphrey, Technical College, Sunderland, Ronald Johnson, City Technical College, Liverpool; Alan Gibson Long, Acton Technical College and The Polytechnic, Regent Street, London; Leonard Lowes, Constantine Technical College, Middlesbrough; Robert Pattison Marshall, Technical College, Chesterfield; Alexander McDonald McConnell, Royal Technical College, Glasgow; Edmund Peter Mills, B.Sc. (Lond.). Technical College, Coventry; Dennis Clifford Nicholson, Northern Polytechnic, London; Ronald James Powell, City Technical College, Liverpool; John Roy Prescott, Technical College, Coventry; Raymond Thompson, North Staffordshire Technical College, Stoke-on-Trent, and University College, Nottingham; David John Waters, Technical College, Coventry; Albert William White, B.Sc. (Lond.), Royal Technical College, Salford; Norman Samuel Wooding, Technical College, Coventry.

Fellowship

Branch E, the Chemistry, including Microscopy, of Food and Drugs and of Water: Arthur Alcock, Richard Arthur Dalley, John Valentine Smart.

Branch G, Industrial Chemistry: with special reference to Petroleum: John Mackay Harkness.

With special reference to Paper Manufacture: Miss Helen Mackay McKenzie, M.A., B.Sc. (Aberdeen).

With special reference to the Paint Industry: James Musgrave, B.Sc. (Dunelm).

Special examination in Pharmaceutical Analysis: William Harold Cullen Shaw.

American Chemical Notebook

From Our New York Correspondent

CHEMICAL engineers lead the entire engineering profession in earning capacity, according to a report by Andrew Fraser, Washington, D.C., consultant, which appears in the current issue of *Chemical and Engineering News*, a publication of the American Chemical Society. A survey of engineering income for 1946 reveals, according to the report, that at all experience levels the composite earnings capacity of chemical engineers " exceeded that of mining-metallurgical engineers, who, in turn, were followed by men engaged in other engineering fields, and in mechanical-industrial, electrical, and civil engineering."

This earnings advantage of chemical engineers, who last year constituted 10 per cent of the engineering profession in the continental United States, is all the more remarkable, the report states, because chemical engineers are a younger-aged group. " In 1946, their median years of professional experience were only 10 years," the report points out. " This figure contrasts sharply with those of engineers in the other five fields mentioned above, whose median years of professional experience ranged from 13 to 23 years."

* * *

A new water-soluble polymer, known as Amberlite W-1, possessing unusual qualities of uniformity and stability, adhesion, compatability and ability to be insolubilised, was announced this week by the Resinous Products and Chemicals Company. Preliminary tests of the new polymer, company officials said, reveal its value in the manufacture of wet strength paper, adhesives and cements, as a thickener for latex and Neoprene, and indicate potentialities for reproduction operations, printing techniques, sizing and all types of coatings.

* * *

A finish for interior surfaces that will withstand marking by water, heat, alcohol, acids and grease seems a possibility, reports the United States Department of Agriculture, as a result of some recent research at the Eastern Regional Research Laboratory, which has developed a new product known as allyl sucrose from sugar. Such a finish for furniture, wall coverings, interior surfaces and woodwork would be a boon, not only to homes but also to hotels and restaurants. The research done at the Eastern Regional Research Laboratory forms part of a programme of work being done at this and three other regional research laboratories of the Bureau of Agricultural and Industrial Chemistry to find new industrial uses for farm products. It opens a new field of research in the preparation of several somewhat similar derivatives of sucrose.

Two new reparations plant to be put up for sale by the U.S. Government include portions of the Dynamit A.G., Goostacht-Krummel, and equipment from the Paraxol at Lippoldsberg, Germany. It includes units for the production of formaldehyde, pentaerythritol, and plastics. Both plants are reported to be in good condition and of special interest to American manufacturers of synthetic resins.

The Krummel plant, located on the Elbe River about 19 miles south-east of Hamburg, was the original site of the first high-explosive plant built by Alfred Nobel and associates in 1865. The plant was extensively remodelled prior to 1940. The equipment consists of 21 items used in the production of plastics with grinding mills, distilling vats, specially lined tanks for storage purposes, a crusher for artificial resins, and allied facilities.

The parts of the reparations plant at Lippoldsberg offered for purchase include one producing unit for formaldehyde and two units for the production of pentaerythritol together with the electrical generating equipment used with these units. It is known that the material allocated to the United States was only slightly used during the war, because of the lack of material and transportation. The current production of pentaerythritol is approximately 14,000,000 pounds, according to an estimate by the United States Department of Commerce.

* * *

Figures covering August, 1947, production of normal superphosphate fertiliser material, released this week by the Bureau of the Census, U.S. Department of Commerce, reveal that at the end of August stocks on hand totalled 705,855 short tons, approximately 100,000 tons more than at the end of August, 1946. Concentrated superphosphate production in August was below the July output but was more than 2000 tons greater than the August, 1946, figure. Total supply again exceeded 90,000 tons, due to the large amount of stocks on hand at the beginning of the month.

* * *

E.I. Du Pont de Nemours & Co., Inc., was owned by 90,984 different stockholders as at September 30, 1947, a decrease of 554 from the number of holders recorded at the close of the second quarter of 1947, company officials announced this week. There were 73,807 holders of common stock and 23,082 holders of preferred stock as the third quarter ended. These figures include 5905 holders of more than one kind of stock. Of the owners of the company, more than 40,000 stockholders are women.

LUMINESCENT PIGMENTS

High Purity Zinc Sulphide as Base

THE investigators who prepared the BIOS Final Report No. 2, "Luminescent Pigments at I.G. Farbenindustrie, Leverkusen and Riedel de Haen A.G.," which is now issued with the usual warning regarding the possible infringement of existing patent rights, were primarily concerned with inorganic pigments as such and not specially with the luminescent variety. The report will, however, be of interest to British technicians engaged in the manufacture of luminescent materials.

Not only are details given of the manufacture of the various types of pigments and their activators, but interesting physical data are included at the end of the report on the various pigments which have been brought to this country. There appeared initially to be very little difference between the results of comparative experiments with the German and corresponding British products, but the British materials eventually proved to be superior after accelerated weathering tests.

Zinc Base

The basis of the I.G. luminescent materials is the preparation of a zinc sulphide of high purity to which is added, before calcination, controlled amounts of various activators and fluxes. For luminescence in ultra-violet light the activators used by the I.G. are metal filament lamps in conjunction with small amounts of copper chloride or sulphide added to the zinc sulphide. A pigment suitable for the production of a long after-glow, after excitation by sunlight or artificial ultra-violet light, contains a small amount of cobalt as well as copper and zinc sulphide.

Riedel de Haen manufacture various luminescent pigments based on four different types of materials: (a) alkaline earth sulphides, (b) zinc sulphide and zinc cadmium sulphide, (c) zinc silicate, (d) calcium tungstate. Full details of the preparation of each type of pigment are given in the report.

Some general points of interest are as follows: Luminescent pigments based on alkaline earth sulphides are comparatively unimportant because of their poor water resistance. Many of the fluorescent pigments based on zinc sulphide are activated by silver. One interesting feature in connection with the manufacturing equipment is that P.V.C., presumably the unplasticised type, is used in certain sections of the plant to prevent contamination of the pigment with metals which would be likely to interfere with the properties of the final product. Pale linseed oil copal varnish is the most suitable medium for dispersing luminescent pigments.

Of interest is this formula for the preparation of a green luminescent pigment based on zinc sulphide:—

Zinc sulphide, 27 kilos; copper impregnated zinc sulphide, 3 kilos; cadmium sulphide, 0.6 kilos; sodium chloride, 1.5 kilos; sulphur, 1.5 kilos; ammonium chloride, 0.6 kilos; magnesium carbonate, 0.015 kilos.

The mixture is ground for two hours in a porcelain ball-mill and then transferred to a crucible. This is then gently heated for one hour after which the temperature is raised to 1100°C. over a further hour and this temperature maintained for 60 minutes To prevent blackening, the mass is poured into distilled water and washed free of chloride by suction; 30 kilos of pigment are then added to 600 cc. of sodium silicate (38°-40° Be) diluted with 5 litres of water, the plant for this purpose being lined with P.V.C. Five litres of methanol are then added and after stirring for 15 minutes, the solid is filtered off, dried, and stoved for 2 to 3 hours at 70°C.

PHENOL DISPOSAL

The problem of elimination of corrosive phenol from the waste liquids of chemical plants, which in the past has created a serious problem for sewage disposal plants, may be solved if a new process invented by two New York chemical engineers is successful.

Owing to the strong toxicity of the phenol, even in minute concentrations, sewage plants cannot successfully handle wastes containing this chemical, since it kills the bacteria needed for sludge digestion in sewage disposal operation. For cities obtaining drinking water from such rivers as the Ohio and Mississippi, phenol creates another problem, since in passing through the sewage disposal plants of one city, it may flow, unchanged, down-river to contaminate the drinking water of another city. Chemical plant methods for pre-elimination of this material prior to its discharge into sewage lines are now very expensive.

The two engineers responsible for the new process have now found that phenol can be removed by first adding common salt to the wastes containing the phenol, and then distilling the resultant mixture at high pressures. The phenol is obtained as one of the products of the distillation in concentrations which allow it to be processed into a pure material.

PRINCIPLES OF PRESSURE SPRAY NOZZLES—II

Determinants of Drop Size

by H. L. M. LARCOMBE

MANY of the results of nozzle investigation have considered only water as the fluid being sprayed; but a great many other fluids are sprayed besides. Although the laws are not fully formulated for all the physical conditions of fluids, certain empirical rules can be stated which allow interpolation and calculations based on those obtained from water or other fluids.

For pressure nozzles these are as follows:

a. Drop size is approximately inversely proportional to the square root of pressure.

b. Drop size increases approximately as the square root of the viscosity.

c. Drop size increases approximately to density.

d. Drop size increases approximately to surface tension.

The above rules can be applied also to approximate the size distribution. If liquids of different properties are sprayed the same size distribution will be obtained at different pressures.

Table 1 shows the drop size distribution for three hollow cone nozzles of a similar design to that shown in Fig. 1(6) and indicates the information which is important in all nozzle specifications but which is unfortunately not always available.

The Falling Drop

In addition to the fact that descending drops do not follow entirely either the gravitional laws or Stokes' Law over the entire descent it is also true that they do not remain truly spherical. An approximation of this effect can be made which has a bearing on the design of absorbtion scrubbers and to a lesser extent on spray drying.

The full study of this deformation is outside the scope of this paper but the following discussion is included to present this fact in its relationship to the nozzle performance proper.

Saito in Japan[7] demonstrated mathematically that, in the case of water droplets falling freely in air, the forces acting on the drops tend to deform them into spheroids oblate normal to the direction of motion. In contrast, it is interesting to note that the theoretical treatment for mercury droplets shows their tendency to prolate spheroids. It has also been shown by Lenard[8] that raindrops, initially spherical, take the shape of inverted cups at velocities of 6 to 8 metres per second, finally bursting into fragments. The disrupting velocity varies from 20 to 10 metres per second for drops from 2.5 to 6 mm. in diameter. Arnold shows that drops falling by gravity reach a terminal velocity much less than that obtained from Stokes' Law when the drop is greater than 2 mm. diameter.

Using the observed terminal velocity for a given size drop, it is possible to calculate the maximum deformation that may occur when there is a flattening normal to the direction of motion. For an example of these calculations reference may be made to Johnstone and Williams[6].

Velocity and Trajectory

These important factors should be considered in two parts: first, the velocity of the droplet issuing from a nozzle with no induced rotation in its flow; and, second, the nozzle which does employ the rotative principle.

The applications which require high velocity jets usually employ the fluid to perform work. *e.g.*, in the descaling of hot steel billets, mould cleaning, or the cleansing of wire screens.

The initial velocity of droplets in a non rotating flow can be assumed for all practical purposes to be equal to the velocity of the fluid stream through the nozzle orifice, which in this type of nozzle runs practically full bore. The velocity will, therefore, be the volume per unit time

TABLE 1
NUMBER OF DROPS IN EACH SIZE GROUP—NOZZLE No. 2

Nominal Drop dia. in Microns	0.063" dia. Orifice			0.086" dia. Orifice		0.128" dia. Orifice
	50 P.S.I.	100 P.S.I.	200 P.S.I.	100 P.S.I.	200 P.S.I.	200 P.S.I.
10	375	800	1,700	100	300	100
25	200	280	580	60	150	50
50	160	180	260	41	100	45
100	50	60	70	26	34	27
150	27	31	35	14	18	15
200	19	23	27	9	12	11
300	8	9	11	5	8	6
400	2	4	4	4	7	3
500	1	1	—	2	1	2
600	1	—	—	1	—	—

(Water 70° F.)

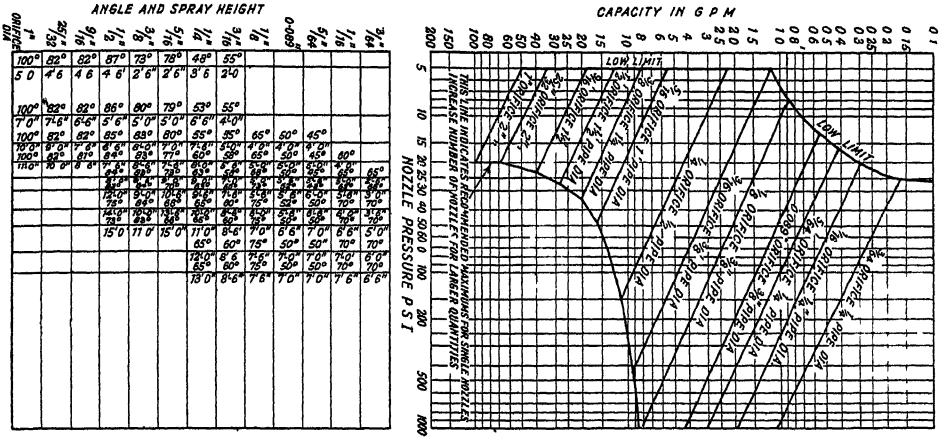
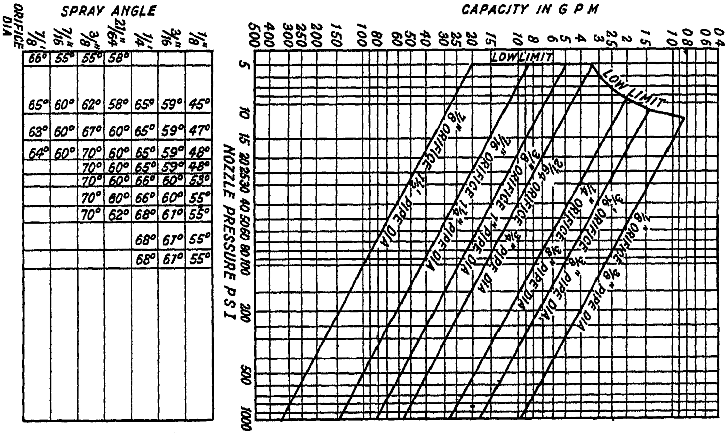


Fig. 4. Performance of nozzle No. 4



F g. 5. Performance of nozzle No. 1

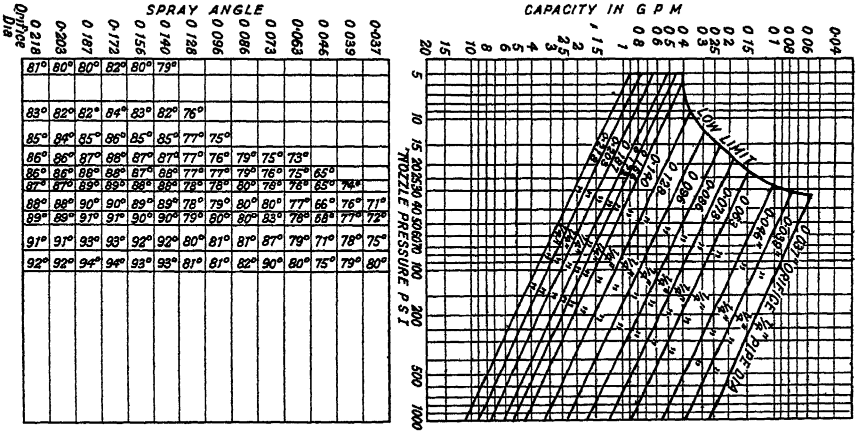


Fig. 6. Performance of nozzle No. 2

divided by the cross sectional area of the nozzle.

With the nozzle with induced rotative flow the problem is not so simple. The initial velocity of the droplet is dependent on the angular velocity of the fluid in the orifice and the axial velocity of the fluid through the orifice. Neither of these quantities is easy to determine, as it is almost certain that the orifice is not running full bore.

For work on droplet trajectory under all practical conditions reference should be made to the work of Lapple and Shepherd[9]. water at room temperature, but for more viscous liquids this pressure must be increased to effect a sufficiently turbulent and unstable jet which will rupture and form into droplets. The question of the pressure required for increased viscosity is discussed later in this paper.

Doble$_8$ has formulated the equation:

$$\frac{\text{Volume/Unit Time}}{\sqrt{\text{Pressure}}} = K = \text{Constant}$$

The capacity-pressure curves shown in Figs. 4 to 8 have not been found to follow this relationship exactly. The relationship in the above equation is closely followed with some of the nozzles but not so in all of them.

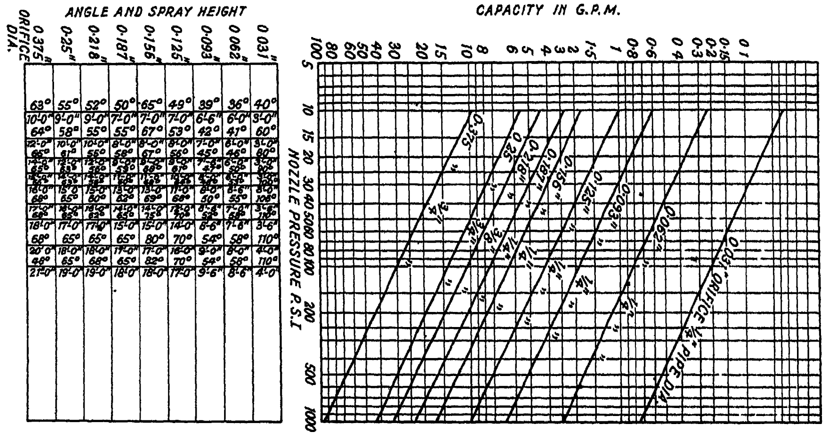


Fig. 7. Performance of nozzle No. 5

For a constant orifice size and similarly dimensioned nozzle, capacity increases with pressure. The relationship between the two factors has been plotted from water capacities actually obtained from various designs of nozzle and has been found to be a Log-Log relationship within a pressure range of approximately 0-1000 lb.

Pipe size to the nozzle has a bearing on the capacity but this is not sufficient to cause any discrepancy if the pipe size is in proportion relative to the nozzle.

Charts have been made of the characteristics of various commercial type nozzles shown in Figs. 4 to 8 and indicating the Log-Log relationship referred to. There is a low limit pressure below which certain nozzles will not operate efficiently, this is shown on the curves in the figures mentioned

The low limits of pressure shown are for

The constant is a function of the proportions and construction of the nozzle and K can be deduced from the curves, if it is required for methods of nozzle comparison.

Doble's formulæ for the predetermination of this constant apply only to one type of nozzle which was tested with water. It is highly probable one of the reasons why the Doble's relationship does not apply in the case of those nozzles shown with a rotating jet is that, for reasons of construction, the internal proportions of the nozzle are not a dimensional function of the orifice. It will be noticed in the vortex type nozzle (Fig. 5) that the value of K is not constant. In Fig. 7 the Doble relationship follows the curves fairly closely in a nozzle design with no induced vortex element in the flow. (*To be continued*)

Performance Of Nozzle No. 6

Capacities in gallons per hour at pressures up to 100 P.S.I.

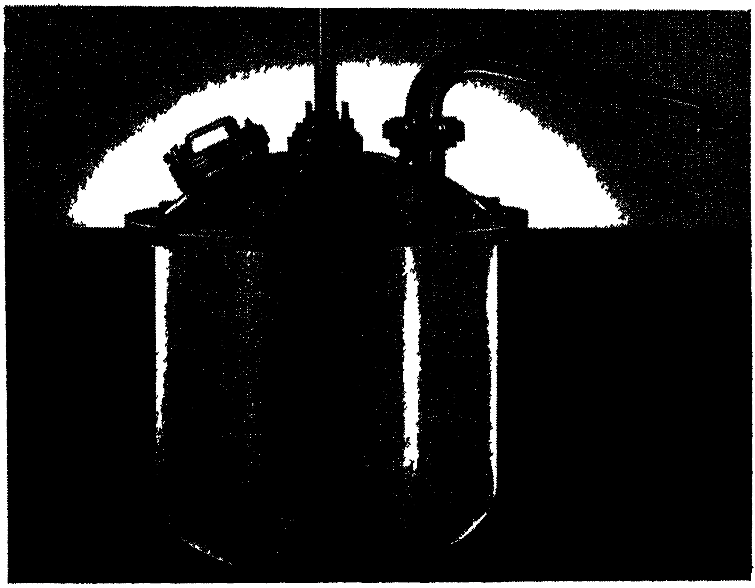
Orifice diameter inches	40	50	60	70	80	90	100
.012			.625	.660	.700	.740	.780
.018	1.32	1.47	1.59	1.68	1.78	1.87	1.96
.040	2.2	2.5	2.75	2.95	3.10	3.30	3.40

(Water 70° F.)

Fig. 8

Metallurgical Section

Published the first Saturday in the month



* * *

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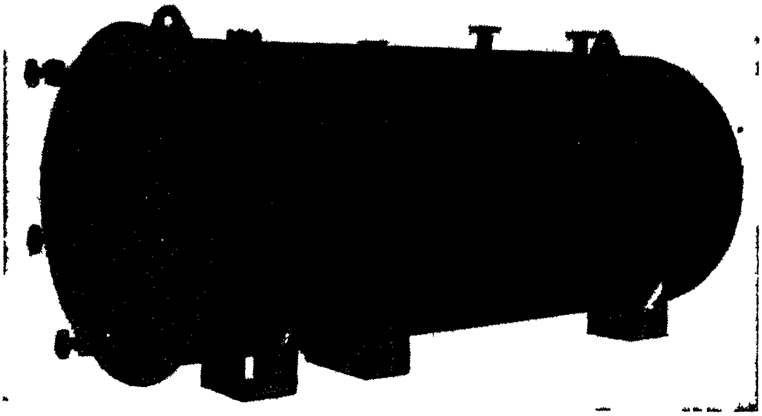


Illustration shews M.S. Rubber Lined Tank for Hydrochloric Acid

TANKS. CYLINDRICAL AND RECTANGULAR
PUMPS AND FLOW METERS, ETC.

Metallurgical Section

1 November 1947

The Fluoroscope as a Flaw Detector

Effective Substitute for Radiography

by L. SANDERSON

THERE has been a marked development of radiographic inspection of steel castings of recent years, and the expert radiographer has also been widely employed in examining light alloy castings for flaws. The value of radiographic examination is not disputed, but it should not be forgotten that the fluoroscope is an important instrument for detecting flaws in castings.

Fluoroscopic Examination

There are several patterns of commercial fluoroscopes, and it is not practicable here to describe them in detail. A brief account of one method of examination in which this instrument is used will be of more value.

The castings to be examined are placed on a series of conveyor trays carried by an endless belt through a tunnel lined with lead over a 140 kvp industrial X-ray unit or tube. The inspector is located in a dark chamber situated directly above the castings so that he can watch the screen by looking downwards at a horizontal screen above the castings. The trays are capable of controlled movement, from zero to a maximum of 20 ft. per minute, as desired.

The window through which the inspector looks is a normal 1 in. thick assembly of lead glass, treated so as to minimise reflections from the surface. The X-ray tube has a 24 mm. focal spot and functions at a voltage of 140 kvp, the tube current being 8 ma. The factors most affecting the results obtained are the thickness of maximum section of the casting, the speed of movement of the castings undergoing inspection, the space separating the X-ray tube from the bases of the conveyor trays, and the distance between screen and casting.

Vital Points

In carrying out a fluoroscopic inspection, certain vital considerations must be borne in mind. There is no golden rule which indicates the minimum dimensions of the discontinuity or blowhole, gas bubble, etc., it is desired to detect. The size of cavity that can be detected depends on the total area of metal affected, the cross section of the cast part, the rate at which the cavity diminishes in thickness towards its boundaries, and other factors not fully understood as yet.

On the whole, it is much harder to detect a defect forming a spherical cavity than one which takes the form of a long cylinder of equivalent diameter, while a cavity shaped after the fashion of a ring but of diameter equal to that of the cylinder, will be harder still to find. It appears that the sharper the edges of the image, the easier it is to see, and that images of small dimensions cannot have sharp edges by reason of the grain of the screen.

Effect of Cross Section

The heavier the cross section of the casting, the higher the degree of percentual sensitivity,. and the relation between these factors is virtually proportional. Absolute sensitivity, however, declines with increase in cross section.

The best results are obtained when the focal spot of the X-ray is placed approximately 5 in. from the bottom of the trays. A decline in focal spot-screen distance over the range raises the brightness of the screen by a factor of $\left(\begin{array}{c}\text{—}\\ 23\\ \text{—}\end{array}\right)^2 = 8.3$. As the screen brightness becomes greater, less dark adaptation is necessary for easy observation. Those portions of the casting that have not been masked do not develop a marked glare. and this fact means that complicated masking is not needed.

The Plastic Cell

The location of the X-ray tube as close as 5 in. to the tray bottoms gives a much brighter screen, and although some users still employ the lead glass window with a distance of 20 in. between tube and tray bottoms, it is considered better to dispense with the lead glass because of the rapidity with which it discolours when subjected to the action of X-rays at short distances.

Modern fluoroscopy employs instead a plastic substance known as Lucite in the form of a cell containing a virtually saturated solution of lead perchlorate. If the cell has a thickness of 3 in. of solution it will be almost the equivalent of 1 in. of lead glass or $\frac{1}{4}$ in. of metallic lead.

These cells are not affected in any way by the rays, and both plastic material and perchlorate solution have the same refractive index, which means that they have no surface reflection between them.

Assuming that the cell thickness is a fair proportion of the entire viewing distance, there will be a foreshortening caused by the solution, and this will appear to enlarge the image by D × R, where D is a number of diameters, and R is the refractive index of the solution.

Under even the most favourable conditions, the fluoroscope cannot produce so good a result as radiography, where ultimate contrast is desired. The reason is that the X-ray film is a device for amplifying contrast, whereas the fluoroscopic screen is not. If the X-ray tube current is strengthened, there is an increase of corresponding amount in physical brightness, but the gain in contrast is relatively slight. In consequence, no benefit appears to be derived from employment of the considerably more expensive X-ray tube equipment required for work at a tube voltage of 160 kvp and a tube current of 15 ma. (representing a doubling of the current).

In fact, it is not possible to make the screen bright enough by increasing the tube current, the reason being the heavy power consumption required and the equivalent amount of heat to be dispelled at the target. Moreover, if the tube current is intensified, it will be neccessary to increase the dimensions of the focal spot.

The Short Distance Tube

It follows, therefore, that to bring the distance between tube and tray bottoms down to about 5 in. with the employment of a higher voltage is the sole practicable means of developing adequate screen brightness with the equipment purchaseable to-day. It has been suggested that a higher voltage than 150 kvp might be advantageous, but no experimental proof of this has yet been obtained, and experts are inclined to doubt whether it would make the screen brighter, at all events in thin sections, though with heavier sections there might be an improvement. Another suggestion is that the screens should be sensitised for increased efficiency at higher voltages, but so far no experiments in this direction have been carried out.

We have seen that the primary purpose of locating the tube close to the tray bottoms is to give a brighter screen, but the procedure has its disadvantages.

In the first place, the field of view is less extensive, which means that the distance between tray and focal spot cannot be reduced below 5 in. save when extremely small cast parts are being examined. Assuming the screen to be approximately 3 in. above the tray bottoms—and it is always desirable that it should be as near as possible, without risk of its being fouled by the moving castings—the field on the screen will have a diameter of approximately 7 in., with one side diminished by the shadow of the target. Certain types of castings need a larger distance between object and screen if the object is not to foul the latter. The result of this increased screen distance is a larger apparent field of view.

Secondly, those flaws not near to the screen have extremely blurred shadows by reason of the dimensions of the focal spot, and if the spot employed exceeds 2.4 mm., this effect is even worse. On the other hand, it does not necessarily hinder the inspector from perceiving a flaw, but it makes it difficult for him to see details at the boundaries, and therefore he may not be able to decide whether the flaw he detects is a gas hole or a slag pocket. For this reason it is often advantageous to turn the part over for a further inspection.

Detection of Defects

A second advantage of short focal spot object distance is worthy of note. If the cast part makes only a slight movement in relation to the focal spot of the tube, it sets up a considerable rotational distortion effect on the object shadow, and this, while not impeding the observer, helps him, as it happens, to perceive a number of flaws that would otherwise escape his notice.

Flaws concealed by ribs, lugs, and other heavier sections can become perceptible as a result of the apparent change in location or rotation of the part. The movement of the trays in relation to the tube causes rotational scanning in one direction. Scanning at right angles to the tray movement is facilitated by placing the X-ray tube on a rack. This enables it to be moved 6 in. Defects have been perceived in this way that were not detected even by a radiograph taken in several directions.

Limitations of the Fluoroscope

It must be recognised that the fluoroscope will not reveal an extremely large number of small flaws capable of perception on the radiographs, but if rotational scanning is employed, a remarkably large number of medium and bigger flaws are revealed that do not show up on the radiographs. How far the fluoroscope can be employed, therefore, depends on the distinction drawn between flaws liable to cause rejection and those that can pass the inspector. Much work has still to be done, and the instrument has been primarily employed, up to now, in the examination of light alloy castings. Some most valuable work has been carried out by the California Institute of Technology in this connection.

IRON SULPHATE RECOVERY

German Practice Reviewed

PROCESSES employed in Germany for recovering iron sulphate from spent pickling liquors have been described in a report just released by the office of Technical Services of the U.S. Department of Commerce. Besides recovering the iron sulphate, the processes check pollution of streams and public water supplies and improve the pickling operation itself.

Although developed primarily to check stream and water supply pollution and recover iron sulphate, the processes are said to give more uniform results in pickling operations, and require less supervision Above certain concentrations, the iron sulphate acts as a pickling inhibitor, so that smaller quantities of other inhibitors need be used. Information on equipment and labour required, 11 drawings illustrating machinery and other operational data are included.

New Recovery Plants

In 1941, German plants with a sulphuric acid consumption of 24,875 tons, recovered 15,700 tons of iron sulphate, a low rate presumably due to the wartime emphasis on production of essentials rather than by-products. It is estimated that over 100 recovery plants have now been ordered or installed in Germany. Before the war about 6000 tons of recovered iron sulphate were sold for such agricultural purposes as weed control, treating seed grain and killing insect pests. About 1200 tons were used as a flocculant for water purification in place of ammonium sulphate. Some was also used in tanning, dyeing, and wood preserving.

Treatment with Ammonia

The Germans have also treated iron sulphate with ammonia (mainly in aqueous solution) to produce ferric hydroxide and ferric oxide (by chemical precipitation), and ammonium sulphate. The ferric oxide is used as a pigment for paints and as a polishing material in the optical industry. The ammonium sulphate is used as fertiliser. In the author's opinion, German experience with iron sulphate recovery "should definitely prove that iron sulphate recovery from spent pickling liquors has passed the stage at which its usefulness should still be doubted. . . . The process, from every viewpoint, has become an established fact, with a sufficient number of advantages in its favour to render its installation worthwhile."

Enterprise Scotland Visitors.—Visitors to the "Enterprise Scotland" Exhibition numbered 456,193.

IMPROVED GAS PURIFICATION

Process for Sulphur Removal

AN improved gas purification process, more particularly for removal of sulphur from industrial gases, is the subject of English Patent No. 95/1946 of the Koppers Co., Inc., now open to inspection. The use of suitable organic sulphur absorbents are already known but are subject to various disadvantages. The principal object in the present invention is to provide a method of separation by use of amine absorbers of organic sulphur compounds in which the absorbent is only moderately in excess of that required for absorption, associated with an oil scrubbing medium.

Scrubbing Medium

The various absorbing agents suggested are primary or secondary amines, such as morpholine or piperidine and homologues, or hydrogenated tar base fractions. Among the primary are mono-ethanolamine and iso-octylamine which have given good results. The scrubbing medium, which must be a solvent of amines and form sulphur complexes, may be water, aliphatic alcohols, ketones, or hydrocarbon oils. By way of example, the use of morpholine wash oil scrubbing medium is described and illustrated.

The morpholine sulphur complex and other salts are dissolved out of the scrubbing medium by sodium hydroxide solution to form principally the corresponding sodium compound, and available free morpholine is divided between scrubbing medium and caustic solution. Various agents may be used for reviving the scrubbing medium, such as, tricresyl phosphate and glycerol, or, as in co-pending application, it may be revived in a contactor, preferably with water, and then returned into the operating cycle.

Korea's Chemical Industry

BEFORE the surrender of Japan, Korea's chemical industry was highly developed by the Japanese, states Summation No. 20 of U.S. Army Military Government Activities in the country. The subsequent evacuation of the Japanese and the partition of the country at the 38th parallel resulted in the severance of the chief sources of raw materials, including, of course, of coal, of skilled technicians and of replacement parts for machinery and equipment.

Of South Korea's three chemical fertiliser plants, the summation adds, producing calcium superphosphate at Inchon, calcium cyanamide at Pukpyongni and potassium sulphate at Mokpo, only the last is now in operation, and in March last was stated to have ground 2450 metric tons of phosphate rock.

PRINCIPLES OF DIE CASTING

A Study of Contemporary Practice

ONE of the most comprehensive studies of the fundamental principles of die casting, reviewing the metallurgical considerations and selection of alloys for special purposes and presenting many vital data in tabulated form is the booklet just issued by the Federated Metals Division of the American Smelting and Refining Co.

The most rapid progress in the die casting field has been made during the past 25 years. The development of high purity (99.99 per cent) zinc, which is of recent origin, was instrumental in rapidly expanding the industry. Next to the tin-lead alloys, those made of zinc offer the least difficulty in manufacturing.

Castings of the original zinc alloys, however, showed deterioration and instability, due to the fact that the effects of minor impurities within these alloys were unknown. The introduction of high purity alloys alleviated most of these problems and to-day die castings made of zinc base alloys are used in the same way as other engineering materials and covered by specifications and standards.

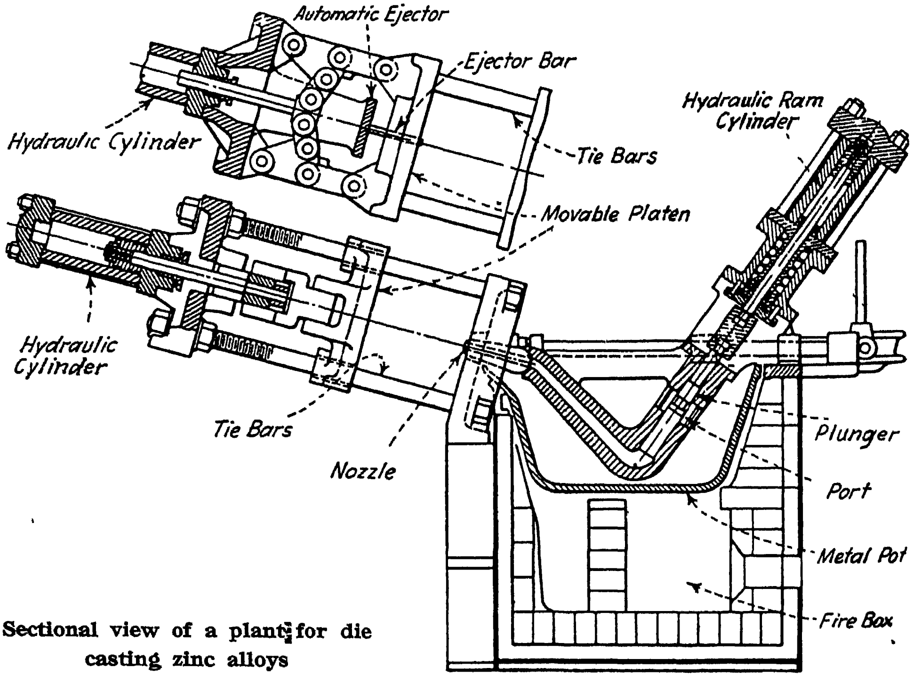
Alloys that are commonly die cast are those of zinc, aluminium, magnesium, copper, tin, and lead in approximately the order named. Alloys of the latter two are used only to a limited extent; the zinc base alloys account for more than two-thirds of the die castings made in various countries to-day.

This is due in part to the low melting point of these alloys and the ease with which they can be handled in the die casting shop. In view of their low pouring temperature, die cost and maintenance are lower than any of the higher melting alloys. The castings can be held to very close dimensional tolerances and they are easily machined and finished. Their excellent mechanical properties are exceeded only by those of the copper base alloys. Great advantage lies in the fact that castings made from zinc base alloys are, in general, cheaper than those made of competitive alloys.

High Pressures

The use of many alloys in the die casting industry has brought about the development of machines tailored to accord with the characteristics of the metals to be cast. In general the two types of machines use either a hot chamber or a cold chamber. The cold chamber machines use pressures ranging from 5000 to 50,000 lb. per sq. in. and are referred to as high-pressure cold chamber machines.

(*Continued on page* 604)



Sectional view of a plant for die casting zinc alloys

TIN AN ANTI-CORROSIVE

A RECENT issue of *Tin and Its Uses*, published by the Tin Research Institute, contains an interesting and informative account of research work undertaken by the Institute in connection with the use of tin coating as an anti-corrosive material.

Over a four-year period a series of tests has been carried out with various steels A number of identical steel panels were undercoated with all the well-known corrosion-resistant materials, or were subjected to one or another of the various rust-prevention treatments before being painted in the normal way. At the same time a few panels were given a thin coating of tin (0.00005 in. thick) before the paint was applied. Periodical examination revealed that not only did the pre-tinned specimens retain their paint longest, but the tinned surface where exposed was free from rust and could be repainted without the need for cleaning and scraping. The untinned steels, however, had rusted beneath the paint.

Quite apart from the protective value of tin as an undercoat for painted steel—its recommended thickness is 0.00003 0.00005 inches—there is also the added advantage that the estimated cost of applying an undercoating of tin to both surfaces of a sheet of steel amount to less than a quarter of that for labour and materials required to apply a coat of paint to one side of the sheet.

ZINC AND TITANIUM

Wider Use in Paints Approved

FOR a good many years—records the bulletin of the Zinc Development Association—official pronouncements on outside paints have concentrated mainly on white lead among the available white pigments. The recent revision of B.S.929 on "Ready Mixed Paints," which has just been published, alters all this. It no longer prohibits the mixing of white lead with other pigments. For outside work it allows mixtures of two or more of the titanium dioxide, zinc oxide and white lead paints; for inside work mixtures of two or more of the above three pigments and lithopone. This recognition of the value of mixed pigments is in line with modern manufacturing experience, and represents a forward step in the art of paint making, which the Zinc Pigment Development Association welcomes.

A foreword to the specification urges that full advantage should be taken of this provision, so that the use of available raw materials now in short supply shall be spread over a greater quantity of paint.

The restrictions on the use of lithopone, the bulletin suggests, are hard to justify in view of its entirely successful use in the past.

OFFICIAL NOTICES

Zinc Sheets and Rolled Zinc

The Ministry of Supply announces that the prices of zinc sheets and rolled zinc (boiler plates) has been increased by 17s. 6d a ton as from October 16, making the maximum selling price of zinc sheets £82 a ton, and of boiler plates, £80 a ton. The increase is to cover increased manufacturing costs. In addition, the existing premia on thin gauges and odd sizes, not covered by the Statutory Order, will be increased by 50 per cent.

Platinum and Tungsten Ore

Increased metal prices announced in London last week were: tungsten ore, from 122s. 6d.—127s. 6d. to 125s.—132s. 6d. per unit, c.i.f.; platinum, from £15—£15 10s. to £15—£16 10s. per troy oz.

Fluorspar Import Licences

The Board of Trade announces that from October 28, 1947, fluorspar can be imported only on individual licence. Imports have hitherto been unrestricted.

Lactic Casein Prices

The Board of Trade announces that from November 1, 1947, the selling prices of lactic casein, distributed through the agency of the Lactic Casein Importers' Association, Ltd., 23 St. Swithin's Lane, London, E.C.4, will be as follows (per ton):

Mesh	1 *ton and over*	*Under* 1 ton
90	£195	£200
60	£190	£195
30	£190	£195
Soluble	£200	£205

For quantities of under one bag the price is 4s. 6d. per kilo. All the prices are net ex warehouse.

Training for Metallurgists

A period of practical training for young metallurgists entering the steel industry, in addition to their university and technical college studies, was strongly urged by Mr. T. M. Service, a director of William Beardmore & Co., Ltd., Parkhead, Glasgow, in his presidential address to the West of Scotland Iron and Steel Institute in Glasgow on October 17. Metallurgists had recently entered the steel trade with the job of suggesting improvements in manufacturing methods based on the knowledge they had acquired at the university or technical college. Mr. Service said that scientific knowledge alone was not enough, and that it was necessary for young metallurgists to have a minimum of two years' practical works training. If workers knew that those in charge were capable of doing the job themselves they would willingly support any innovations.

Hydrogen Peroxide Process

Production by Electrolysis

THE production by electrolysis of 35 per cent solutions of peroxide of hydrogen is described in a further BIOS report. (BIOS Final Report, No. 683, Item 22; 2s. 8d., post free.)

The process forming the subject matter consists in the feeding of a solution of 500 g.p.l. H_2SO_4 to the catholytic chamber of the first bath; this solution passes through each subsequent bath until it has reached the bottom of the cascade. It is then returned as anolyte feed to the battery through a distribution box and is next passed through one of ten diaphragm series where electrolysis takes placle so as to yield a solution containing 250 g.p.l. of H_2SO_8.

The latter is fed through a steam-heated lead coil where evaporation to roundly half its volume is carried out and hydrolysed to give H_2O_2 vapour and a solution consisting of some H_2O_2 and H_2SO_5 (Caro's acid). The hydrogen peroxide vapour is passed to a fractionating column from which a 35 per cent w/w solution of H_2O_2 is separated, and the vapours passing from the top of the column are passed to a second fractionating column, where a weak solution of 0.5 per cent H_2O_2 is separated.

Acid Removal

To remove as much as possible of the H_2O_2 H_2SO_5 remaining, the acid residue from the lead coil is steam distilled and the vapours passed into the main vapour pipe leading to the first column. The residual acid from this operation is diluted and returned to the electrolysis phase with the exception of 5 per cent, which is purified before returning to the cycle (by distillation).

This process, which was originally worked out by the Osterreichische Chemische Werke, Weissenstein, Austria, was later licensed to the Degussa, where it was used in the main for the manufacture of sodium percarbonate or sodium perborate. Is is worth mentioning that "a fair sized" workshop was attached to the plant, where pipes, valves, etc., were fabricated from products of the polyvinyl type. It was apparent that considerable developments were taking place in the application of plastics for chemical plant.

New Chemical Journal.—Elsevier Publishing Co., Inc., of New York and Amsterdam, has published a new international chemical periodical entitled *Analytica Chimica Acta*. It is an international journal devoted to all branches of analytical chemistry, and is published monthly. The editor is Paul E. Wenger, and the subscription fee 9.50 dollars a year.

Adulteration of Ceylon Papain

Steps are being taken by the Department of Commerce and Industries, Ceylon, to prevent the export of adulterated papain, which often has up to 50 per cent powdered gum arabic, manioc powder or powdered pawpaw fruit. There has lately been a decrease in the export of papain and a probe by the department has revealed that the United States, the chief buyer, is disinclined to purchase Ceylon papain.

Pure Ceylon papain has a ready market in the United States, where buyers paid nearly Rs. 12.50 a lb. earlier this year. With a view to safeguarding the trade and to protect the interests of *bona fide* dealers as well, the Commerce Department has laid down certain conditions for the export of papain.

Polish non-ferrous metal production for September amounted to:

Sulphuric acid 100% ...	8388 tons
Zinc, powdered	6427 ,,
Zinc, sheets	2979 ,,
Zinc ore	72,517 ,,
Zinc pyrites . . .	1253 ,,
Zinc concentrates ...	11,212 ,,
Zinc roasting blendes ...	9915 ,,

(*Continued from page 602*)

In the hot chamber machines, a "goose neck" device, so called because of its shape, is continuously submerged in the molten metal. The latter is forced through the "goose neck" into the die by means of direct air pressure or by a plunger. The "goose neck" or hot chamber machines are used almost entirely for the casting of zinc base metals, since alloys of aluminium, magnesium and copper, because of their higher melting points, are too corrosive to this type of equipment. Such machines operate at comparatively low pressures, in the range of 1000 to 2000 lb. per sq. in.

In general it should be noted that the term "die casting" refers only to machines in which pressures higher than gravity are employed. Castings produced in metal moulds without the use of external pressures are commonly referred to as permanent mould casings.

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Baird & Tatlock Sales Convention

Instrument Delivery Delays

IN association with Messrs. Hopkin & Williams, Ltd., Messrs. Baird & Tatlock (London), Ltd., held a sales convention on Monday and Tuesday last at the Waldorf Hotel—which was presided over by the company's chairman, Mr. J. E. C. Bailey. Over 50 representatives of the company, together with Press visitors, were present and were welcomed by the chairman.

Sales policy and organisation were dealt with by Mr. Hugh Baird, director, who spoke of the company's intention soon to amalgamate the sales forces into one unit at the Cross Street premises where they would have advice of the technical department readily available to answer clients' inquiries. As part of a general policy of sales expansion, agents were to be appointed for this country on similar terms to those already functioning overseas.

Mr. W. H. Brooker (Baird & Tatlock works manager), who joined the company early this year after a period as works manager for a firm of scientific instrument makers in India, spoke of outstanding "prolific orders." The manufacturing programme, he said, had been drawn up to cover a period to the end of 1948. Orders for some instruments, such as periodic balances, incubators and ovens were at present subject to delivery delays of from twelve months to seven years, but by the end of 1948 this period would in most cases be reduced to one year. Apparatus, such as centrifuges, which required motors, were particularly difficult. Deliveries from the manufacturers came through only in "dribs and drabs." More attention was being paid to design and finish.

Laboratory Fittings

The subject of laboratory fittings was dealt with by Mr. C. L. Prior, who gave the principles to be observed in the efficient layout of laboratories, with particular emphasis upon wastes, fumes and ventilation. In advocating teak for bench tops, he stressed that a plastic material had yet to be produced to surpass teak for all general purposes.

Mr. S. J. Kennedy described the work of the standards department set up in 1941 to issue B.T.L. certificates for all apparatus before sale.

Production at the Ilford factory of Messrs. Hopkin & Williams was outlined by Mr. H. N. Ricketts, works manager. Output of fine chemicals and reagents, he said, had this year generally risen 20-25 per cent over last year, and most orders could be executed within a reasonable period. In some cases (about 15 per cent) there were delays of from two to six months. The main difficulties were now material shortages, a deterioration in quality, shortage of skilled labour, and limitation of space and insufficiency of plant. Production of acetic acid, ammonium acetate, and ammonium and potassium thiocyanate for analytical purposes, together with bromine and bromine compounds were all behind schedule, but the position was improving.

Finally, Mr. J. S. Jackson gave a review of some aspects of oil technology, with particular reference to the oil industry's needs for more and better scientific instruments.

ZIRCONIUM OXIDE

Two German Methods Described

In F.I.A.T. Final Report No. 1048 "Zirconium Oxide Production," issued with the usual warning regarding the possible infringement of existing patent rights, the production of zirconium oxide by two methods used at the factory of Auergesellschaft A.G. at Oranienburg is briefly described. The raw material for these processes, natural zirconia, was originally obtained from Brazil but when supplies became unobtainable owing to war conditions, zirconium silicate was used as a substitute.

After a preliminary grinding of the raw material in a crusher, the small aggregate is transferred to a Raymond type mill where it is ground to a fine mesh size. After this initial processing, the ore is converted to the sulphate ($2ZrO_2.3SO_3$) by treating the ground material with sulphuric acid (66° Baumé) at 180°C. The basic sulphate is leached out by dissolving the mass in water, filtering and crystallising the salt out from the filtrate obtained. After washing, the sulphate is dissolved in water and stored for 3 days at 40°C. At the end of this time the zirconium salt is allowed to settle out and after drying, is calcined at 950-1000°C. to produce the pure oxide.

Zirconium oxide is obtained from zircon sand by first fusing the finely ground ore with caustic soda to give sodium zirconate. This is calcined and then dissolved in water to form oxyhydrates. By treating these oxyhydrates with sulphuric acid the basic sulphate is obtained which is then processed in a similar manner to the product obtained from zirconia.

Personal

Mr. F. J. Houwert has been appointed a director of Consolidated Tin Smelters, Ltd.

Mr. B. G. Twycross has been appointed managing director of Pretoria Portland Cement, Ltd.

Mr. R. Y. Rule, a director of Gellatley, Hankey & Co., Sudan shipping agents, has been appointed a director of Sudan Salt, Ltd.

Dr. R. L. Kamm has been appointed senior lecturer in physical metallurgy in the University of Melbourne, Australia. He will succeed Dr. W. Boas who recently joined the staff of the Australian Council for Scientific and Industrial Research.

Miss Muriel Roberts, who holds the distinction of being the first woman public analyst in Great Britain—she is superintending analyst for the Liverpool Corporation—is to be appointed assistant City Analyst at a salary of £850 a year, rising to £1000. She has been in the city analyst's department since 1917.

Mr. J. S. Jackson, of the Shell Petroleum and Refining Co., vice-president of the Institute of Petroleum and chairman of its Standardisation Committee, has retired from both these offices upon reaching the retiring age. As a souvenir of his many years of service with the Institute of Petroleum and the Scientific Instrument Manufacturers' Association, Mr. J. E. C. Bailey, chairman of Messrs. Baird & Tatlock, Ltd., recently presented Mr. Jackson with a miniature gold-plated tar viscometer to serve as an ash tray. The new chairman of the Standardisation Committee is Mr. E. A Evans, chief chemist of Messrs. Wakefields.

Obituary

Prof. John Masson Gulland, of Beeston, Nottinghamshire, recently appointed head of the brewing industry's research organisation, lost his life in the L.E.N.R. train disaster near Goswick, Northumberland, on Sunday last. He was appointed to the Jesse Boot Chair of Chemistry at University College, Nottingham, in 1936.

The death has occurred at the age of 63 of Mr. James Sim, chief draughtsman of Messrs. G. and J. Weir, Ltd., Holm Foundry, Cathcart, Glasgow. He joined the staff in 1909, and carried out much of the pioneering work in the development of the Weir closed feed system and the Weir regenerative condenser, for which he had many patents to his credit.

Next Week's Events

MONDAY, NOVEMBER 3

Society of Chemical Industry. (London Section). Burlington House, Piccadilly, W.1, 6.30 p.m. W. A. P. Black: "Recent Developments in Seaweed Technology."

TUESDAY, NOVEMBER 4

Society of Chemical Industry. (Chemical Engineering Group). Apartments of the Geological Society, Burlington House, W.1, 5.30 p.m. L. Rotherham: "The Selection of Stainless Steels for the Chemical Engineering Industries."

TUESDAY-WEDNESDAY, NOVEMBER 4-5

The British Ceramic Society. (Refractory Materials Section). Royal Sanitary Institute, 90, Buckingham Palace Road, S.W.1. Autumn Meeting. Tuesday, 9.45 a.m., A. H. B. Cross, and P. F. Young: "The Measurement of Apparent Porosity and Bulk Density." J. Mackenzie: "The Changes occurring in Blast-Furnace Stove Refractories during Service"; J. E. Stanworth: "Cristobalite Inversion in a Glass Stone"; R. W. Grimshaw, A. Westerman and A. L. Roberts: "Thermal Effects Accompanying the Inversions of Silica." Wednesday, 10.0 a.m., W. Davies: "British Resources of Ganister and Silica Rock"; C. H. Bacon: "The Testing of Silica Bricks for Service in Open-Hearth Furnace Roofs."

WEDNESDAY, NOVEMBER 5

Society of Public Analysts. Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 6 p.m. D. A. Lambie: "The Determination of Arsenic Pentoxide in White Arsenic"; J. B. Rickson: "A Semi-micro Combustion Method for the Determination of Organic Carbon"; F. Goulden: "Some Observations on the Semi-micro Determination of Carbon and Hydrogen by the Sucharda and Bobranski Method, using a Macro-Balance."

Royal Society of Arts. John Adam Street, Adelphi, W.C.2, 2.30 p.m. Opening of the 194th Session. Sir Harry Lindsay: "Cultural Relations within the British Commonwealth."

Institute of Fuel. (London Section). The Institution of Mechanical Engineers, Storey's Gate, St. James's Park, S.W.1, 2.30 p.m. Mr. Donald Hicks: "The Coal Resources of the Country."

THURSDAY, NOVEMBER 6

The Royal Society. Burlington House, Piccadilly, W.1, 4.30 p.m. A special General Meeting. Dr. H. R. Ricardo: "The Bakerian Lecture."

The Chemical Society. Burlington House, Piccadilly, W.1, 7.30 p.m. F. Challenger and Margaret I. Simpson: "Studies on Biological Methylation. Part XII. A precursor of the dimethyl sulphide evolved by *Polysiphonia fastigiata*, dimethyl-2-carboxy ethylsulphonium hydroxide and its salts"; Mr. Wilson Baker and W. G. Leeds: "Attempts to Prepare New Aromatic Systems. Part I. Cyclo Pentindene, 2- and 3-phenylcylopentanecarboxylic acids, and derived ketones"; Mr. A. Albert: "Acridine Syntheses and Reactions. Part IV. A new synthesis of aminoacridines from formic acid and diarylamines."

Chemical Society. (Bristol Section). Chemical Department of the University, Woodland Road, Bristol, 5.30 p.m. Professor R. D. Haworth: "The Oxidation of Phenols."

Royal Institute of Chemistry. South-West Essex Technical College, Forest Road, Walthamstow, E.17, 7.30 p.m. Scientific Film Display.

Chemical Society. (Nottingham Section). Chemistry Lecture Theatre, University College, Nottingham, 6 p.m. F. S. Spring: "Some Contributions of the Organic Chemist to Biological Science."

SATURDAY, NOVEMBER 8.

Institution of Chemical Engineers. (North-Western Branch). The College of Technology, Manchester, 3 p.m. Mr. A. L. Curtis: "Modern Tar Distillation Plant."

Home News Items

Import-Export Prices.—Wholesale prices of imports as a whole in September were unchanged at the index number of 254 (1938—100) and export prices generally rose two points, to 236.

World Power Conference—1950.—At a recent meeting of the International Executive Council of the World Power Conference at The Hague, it was unanimously decided to accept an invitation from the British National Committee for the Fourth Plenary World Power Conference to be held in London in 1950.

Coal Production Drops.—Total output of coal last week was 3,913,400 tons, 87,000 tons below the 4 million ton level which has been reached in each of the past two weeks. The strike of Scottish miners, which lost 138,530 tons, contributed substantially to the reduction. Absenteeism, however, was down to 9.89 per cent compared with 15.25 per cent a year ago.

Fire at Rubber Dump.—Fire brigades from a number of London boroughs were summoned to a serious fire which broke out at a Ministry of Supply rubber dump at Limmer Wharf, River Road, Barking, on Monday afternoon last. Hundreds of tons of crude rubber are reported to have been destroyed. A nearby petrol storage depot and a paint factory, which at one time were in danger, escaped damage. The fire blazed for nine hours before it was extinguished.

Chemical Lorry Ablaze.—Northwich N.F.S. fought for two hours last week to extinguish a blaze on a lorry owned by Morgan's Transport Co., Manchester. The incident occurred on the Knutsford-Holmes Chapel Road, near Northwich. Fire broke out when the friction of a burst tyre on one of the rear wheels set the woodwork alight. Paper, chemicals, and rubber with which the lorry was loaded, blazed furiously and were completely destroyed. Although the driver escaped from his cabin uninjured, the vehicle was badly damaged.

Ministry of Supply Factory Fire.—Rhyl and Holywell Fire Brigades stood by throughout the night of October 24-25 keeping watch on the fire which destroyed a two-storey workshop at the Ministry of Supply factory at Llanerch-y-mor, near Mostyn. First warning of the outbreak was given by an employee who saw a quantity of magnesium alight. The fire spread rapidly and firemen found a workshop blazing fiercely. They concentrated on preventing the flames reaching a tank containing 5000 gallons of oil only 20 yards away. Damage is estimated at some thousands of pounds.

Non-Ferrous Directorate Moves.—The Non-Ferrous Directorate of the Ministry of Supply has removed to 2 Hyde Park Street, London, W.2; telephone Ambassador 1290.

Unilever Development.—To further their research work on the processing of fruits and vegetables, and the production of animal feeding stuffs, Lever Brothers and Unilever, Ltd., has purchased the Colworth House (Beds.) estate of Lord Melchett.

British Council Scholarship Awards.—The British Council has awarded scholarships for 1947-48 to 256 graduates or others of like status from 62 countries, including the Dominions and Colonies, to enable them to undertake a year's specialist study in the U.K. In addition, 106 British Council scholars have had their scholarships extended for a further year. Of the 362 scholarship-holders, 44 are studying science and technology, which includes such subjects as biochemistry, tanning, aeronautics and aviation.

Urgent Appeal for Scrap.—Because of the dangerously low level of stocks of scrap metal throughout the country, a joint appeal is being sent on behalf of the Iron and Steel Federation, the Joint Iron Council and the National Federation of Scrap Iron, Steel and Metal Merchants, to all large users of metal urgently requesting supplies of steel scrap. Stocks are precariously low and it is emphasised that unless scrap supplies are rapidly increased, the target of 14 million tons of steel in 1948 may not be reached.

Atomic Pictures Banned.—Prohibition of the publication of pictures, taken under official auspices, of British atomic plant in action was the responsibility of the Foreign Secretary (Mr. Ernest Bevin), states the *World's Press News*, quoting the Foreign Office as its authority. Although the Ministry of Supply is responsible for all development of atomic research, publication of facts on the subject is understood to be regulated by a three-year old agreement between this country and the U.S.A.

Winter Coal Supplies Assured.—Distributed coal stocks to public utility undertakings, railways, industry generally, and coal merchants were estimated last week to have reached 14.7 million tons—4 million tons more than at the same time last year. Electricity undertakings everywhere are said to have 40 days' coal reserves (22 last year), gasworks 32 (20), railways 13 (10), and the engineering industry 44 (28). It is assumed, therefore, that there will be no industrial interruptions this winter unless there is a repetition of last winter's Arctic weather.

Overseas News Items

Swedish Wolfram.—Deposits of wolfram ore have been discovered at Norra Karr, Granna, Sweden.

Japanese Rayon Pulp.—Japanese rayon pulp production reached a post-war peak in July of over 8 million lb.—almost double the June figures, while spun rayon yarn production rose to 1.58 million lb.

Moroccan Phosphate Production.—Phosphate production in French Morocco amounted to a monthly average of over 222,800 metric tons for the first half of the current year, as compared with the pre-war monthly average of about 142,000 and 190,300 tons last year.

Finnish Iron-Ore Project.—The Finnish Government is said to be considering a report regarding the exploitation of large-scale iron-ore deposits (of low phosphorus content) at Otamäki in North Finland. Output would run initially at an annual rate of some 250,000 metric tons, and later double that tonnage.

Canada's Rising Chemical Exports.—Canada's exports of chemicals and allied products in the first seven months of this year were valued $50 million, as compared with $38.9 million a year before and only $12 million before the war. Total exports rose from $1251.5 million in 1946 to $1565 million.

New Copper Smelting Plant.—According to a message from Milwaukee, the Allis-Chalmers Manufacturing Company has signed a contract for the construction of a copper-smelting plant at Paipote (Province of Atacama), the total cost of which spread over a period of three years, is estimated at about 6 million U.S. dollars.

Industrialisation of the Philippines.—A comprehensive 15-year plan for the industrialisation of the Philippines includes the erection of two steel mills (one in Manila, the other in Lana), two wood-distillation plants, and one plant each for nitrogen fixation, soda ash and caustic soda, sulphuric acid, copper smelting, and the production of ferro-alloys.

Hungary Increases Aluminium Output.—Most of Hungary's aluminium is produced at Ajka, where there is a foundry (owners—the Hungarian Bauxite Mining Company) which was originally equipped with 144 troughs to produce 800 tons of aluminium. War restrictions made it impossible to use the plant to its full capacity, but by July this year 72 of the troughs were in use again. Only the lack of necessary chemicals for the manufacture of alumina is still keeping production down.

Chilean Minerals.—Mining production in Chile for January-June, 1947, included: Nitrate of soda 795,780 metric tons, copper bars 218,260 tons and coal 1,043,299 tons.

Hungary's 3-Year Chemical Plan.—Budapest reports state that the chemical works in Pet are to be rebuilt according to a three-year plan, and that the nitrogen works will be able to start production of artificial fertilisers in February, 1948.

No Atomic Casualties.—Conclusive proof that radio-active materials can be safely handled is afforded by the record of the atom bomb projects at Hanford, Washington, Oak Ridge and Chicago, where not one case of radiation damage was reported, states Dr. Karl Z. Morgan, of the U.S. atom plant in Tennessee.

Cheaper Synthetic Motor Fuel in U.S.A.—The use of a new catalytic fluidised technique—developed by the U.S. Bureau of Mines for the manufacture of synthetic motor fuel—may lead to a substantial price reduction, thus permitting the product to compete successfully with the natural product.

Mineral Production Mission.—It is reported from Belo Horizonte, Brazil, that a mission from the Rockfeller Organisation (American International Association for Economic Development) is at present in that city studying a plan for economic recovery with the object of promoting an increase in mineral production.

Italian Sulphur Industry's Development.—It is estimated that Italy's sulphur output will aggregate 144,000 tons this year, as compared with 380,000 tons before the war, a decline that is largely attributed to the flooding of many mines during the war, the destruction of equipment, and the shortage of electric power. Although sulphur will presumably again be shipped to a number of Continental and overseas countries, it is doubtful whether the pre-war market will ever be regained because of the present low price of U.S. sulphur.

Restitution to Nazi Victims.—Many exiles from Germany are reported already to have filed claims for restitution of property of which they were dispossessed by the Nazis. This is the subject of a Foreign Office announcement calling attention to a general order issued by the military government in the British occupied zone. This calls on anyone who was dispossessed under duress since January, 1933, to file particulars of his claim to the Landrat of the Kreis or Oberburgermeister of the Stadtkreis in which he resided.

Company News

The nominal capital of **Hazell Chemical Products, Ltd.**, 74 Blackfriars Road, Manchester, 3, has been increased beyond the registered capital of £500, by £4500, in £1 ordinary shares.

The nominal capital of **Pack and Roy, Ltd.**, manufacturers of chemical preparations, etc., 47 Strangeways, Watford, Herts., has been increased beyond the registered capital of £2500, by £2500, in £1 ordinary shares.

The nominal capital of **O. Tobin, Ltd.**, chemists, etc., 50 Paddington Street, London, W.1, has been increased beyond the registered capital of £400, by £1600, in £1 ordinary shares.

The nominal capital of **Overseas Chemical Export Company, Ltd.** (formerly Overseas Chemical Supply Co., Ltd.), Craigs Court House, 25 Whitehall, London, S.W.1, has been increased beyond the registered capital of £1000, by £1000, in £1 shares.

The nominal capital of **Herbert Ferryman, Ltd.**, chemists, etc., Cobden Bridge, Southampton, has been increased beyond the registered capital of £10,500, by £30,000, in £1 5 per cent cumulative non-redeemable pre-preference shares of £1.

New Companies Registered

Lunex (Birmingham), Ltd. (443,680).—Private company. Capital £100 in 100 shares of £1 each. Chemists, chemical plant manufacturers, etc. Directors: R. A. Smith and H. A. Edwards. Registered office: 47 Constitution Hill, Birmingham.

Standard Laboratories, Ltd. (443,154).—Private company. Capital £10,000 in £1 shares 9000 5 per cent redeemable preference and 1000 ordinary). Manufacturers of and dealers in pharmaceutical and chemical products, etc. Subscribers: N. Austin, and F. P. Cadler. Solicitors: Frere Cholmeley & Co., W.C.2.

Bioplastics (Empire), Ltd. (443,785).—Private company. Capital £25,000 in 1s. shares. Producers and manufacturers of and dealers in plastic powders, glass and refractory materials, chemicals, resins, etc. Subscribers: E. W. J. Wood and G. P. J. Francis. Registered office: 88 Kingsway, W.C.2.

Philip A. Godfrey and Company, Ltd. (443,942).—Private company. Capital £2000 in 2000 shares of £1 each. Manufacturers and distributors of and dealers in chemicals, gases, gypsum and acids; manufacturers of and dealers in electrical accumulators, batteries, etc. Directors: P. A. Godfrey and Gertrude Godfrey. Registered office: Chase Street, Wisbech, Cambs.

Scottish Heather, Ltd. (443,833).—Private company. Capital £100 in £1 shares. Exporters, importers and manufacturers of and dealers in chemicals, gases, drugs, medicines, disinfectants, fertilisers, etc. Directors: Capt. J. MacMillan and Mrs. Dorothy E. MacMillan. Secretary: E. S. Webb. Registered office: 86 Blatchington Road, Hove, 3.

Buxton Peat Manattone, Ltd. (443,791).—Private company. Capital £100 in £1 shares. Manufacturers of and wholesale and retail dealers in chemicals, salts, alkalis, drugs, medicines, oils, etc. Directors: M. Samuel, J. Samuel and M. Samuel. Registered office: 44 Brazennose Street, Manchester.

Liquid Heat, Ltd. (443,931).—Private company. Capital £100 in 400 shares of 5s. Manufacturers and distributors of heat exchange liquids of all kinds, designers and manufacturers of and dealers in apparatus and appliances relating to or employing heat exchange media, etc. Directors: Major Wm. E. Langrish-Smith and C. Shaw. Registered office: 103 Cannon Street, E.C.4.

Tolhurst & Neild, Ltd. (444,079).—Private company. Capital £5000 in £1 shares. To acquire the business of thermometer manufacturers now carried on by Bertram Edward and Ernest A. Underhill, at 390 College Road, Kingstanding, Birmingham, as "Tolhurst and Neild." Directors: B. E. Underhill, H. A. Underhill, and E. A. Underhill. Registered office: 390 College Road, Erdington, Birmingham.

Ashill Distributors Company, Ltd. (443,658).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers in chemical and other fertilisers, insecticides, germicides, disinfectants and spraying machines, dealers in seeds and agricultural tools and requisites, etc. Directors: J. K. M. Broadhead, C. F. Robin, D. H. Sanderson, H. G. Parker, and J. F. Cumming. Registered office: 6 Tombland, Norwich.

Chemical and Allied Stocks and Shares

WITH the City following a waiting attitude pending the White Paper on "cuts" in capital expenditure, stock markets were again very quiet. The New Union Goldfields developments had no marked repercussions outside the mining markets, and industrial shares have been inclined to strengthen, partly owing to estimates of the probable net earnings of leading companies, even if Mr. Dalton were to double the Profits Tax. British Funds turned easier and failed to hold best levels, but were again higher on balance.

Imperial Chemical eased to 46s. 3d at

which the yield exceeds 4¼ per cent on the basis of last year's 10 per cent total distribution, which the market is assuming is likely to be maintained. Monsanto Chemicals 5s. ordinary, after 57s. 6d., eased to 56s. 3d., B. Laporte were 81s. 3d., and W. J. Bush 85s. In other directions, Major & Co.'s 2s. shares strengthened to 3s. 10½d., while Stevinson Hardy 10s. ordinary have been dealt in up to 21s. 9d. Fisons were 64s. 3d. Glaxo Laboratories 10s. ordinary changed hands around £18¼, a substantially increased dividend being expected; although it is realised in the market that the extent of the increase will depend on whether there is a rise in the Profits Tax, British Drug Houses 5s. ordinary have continued to transfer around 11s. 3d. This is another instance where substantial benefits accrue to the company from the end of E.P.T., but where the scope for improved dividends will turn on the extent Mr. Dalton decides to increase the tax on company profits, Turner & Newall at 71s. 6d. have not held best levels, but British Oxygen strengthened, and General Refractories 10s. ordinary at 21s. have firmed up on current trading reports. Lever & Unilever (51s. 3d.) have been more active, and Metal Box at 97s. 6d. strengthened, attention being drawn to the scope for growth in export business. British Aluminium at 45s. 6d. have been helped by market hopes that the increase already made in the interim payment may be followed by a higher dividend total for the year.

There was better demand for iron and steel shares, the good yields ruling in this section attracting some attention. It is assumed that nationalisation is shelved for a year and that with steel output at a record level and increasing, prospects of dividends being maintained seem good. United Steel were 25s. 4½d., Stewarts & Lloyds 51s., Dorman Long 25s. 6d., while Colvilles at 27s. 4½d. have responded to the second interim payment. A sharp advance in Firth Brown to 61s. 10½d. was attributed to the company's interest in the projected big iron and steel developments in Rhodesia. Elsewhere, textiles turned easier, but British Celanese have been fairly steady around 24s., awaiting the full results. Associated Cement at 59s. 9d., British Plaster Board 23s 9d., and Tunnel Cement 41s. were again easier on the slowing down in housing, but Wall Paper Manufacturers deferred at 42s. 6d. were helped by the higher dividend and results which exceeded general expectations.

Boots Drug at 53s. 9d. eased slightly, Sangers were 30s. Griffiths Hughes 40s. 7½d., and Timothy Whites 42s. Beechams deferred remained around 21s. 9d. still under the influence of the preference share issue news. United Molasses have been steady at 48s. awaiting the interim dividend, and Distillers 4s. units were 28s. Oils turned easier, although Lobitos were better at 65s. 7½d. pending the dividend announcement. Shell went back to 79s. 4½d. awaiting official news of the expected big Royal Dutch issue.

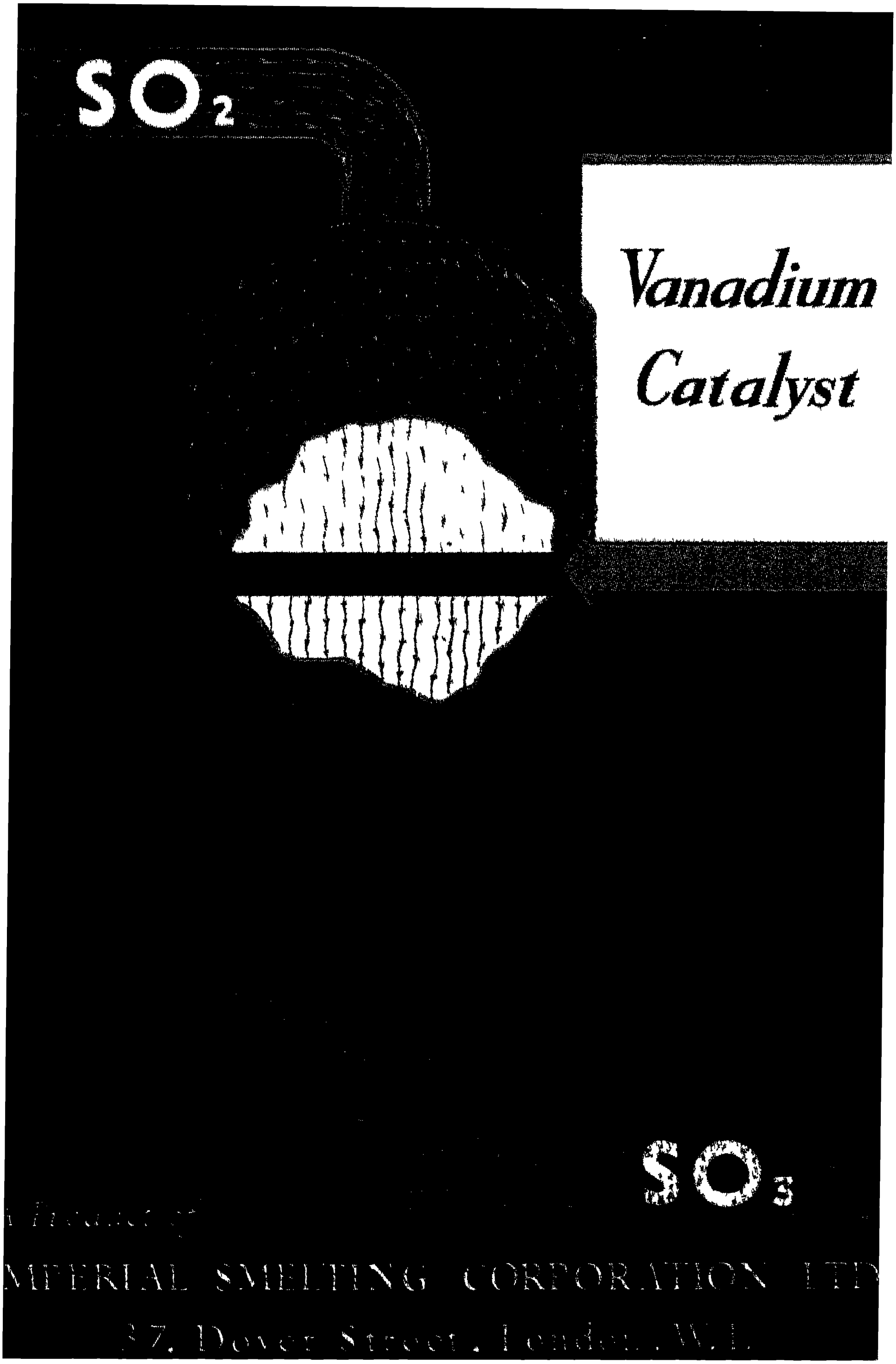
British Chemical Prices

Market Reports

A CONTINUATION of firm price conditions has been reported from nearly all sections of the market and movement, as represented by contract delivery, has been on a fairly substantial scale. Inquiries for new business have been plentiful, although definite bookings for export are difficult, owing to the uncertain supply position. Oxalic, citric and formic acids are firm, with supplies none too easy, whereas tartaric acid is offered for nearby delivery. Soda ash and bicarbonate are scarce, while soda acetate is meeting with a good home demand, although little is available for export. The container difficulty is hampering overseas trade in ammonia liquor, of which there is an ample supply. British formaldehyde is in good demand, with home essential uses absorbing supply. In the coal-tar products market, buyers are finding it difficult to place orders for near delivery and a ready market awaits any parcels that are offered.

Manchester.—Fairly active conditions have been reported on the Manchester chemical market during the past week. Fresh inquiries have been circulating steadily and new home and shipping business has been placed. In addition, there is continued heavy pressure from the textile trade and other leading industrial consumers for deliveries of heavy chemicals already on order, but supply problems in certain of the alkalis and other chemicals remain in evidence. A steady trade in basic slag and other sections of the fertiliser market is reported, and in the tar products market there is a good outlet for most of the light and heavy classes.

Glasgow.—There has been little unusual activity in the Scottish chemical market during the past week. The demand for solvents of all classes continues, but the supply position remains as heretofore. In the export market, demand has continued heavy, particularly for chemicals for the rubber industry, such as accelerators and anti-oxidants. Orders have been secured for some products, but in many cases it is noted that the U.S.A. are quoting cheaper prices. Orders for dinitrochlorbenzene are being lost because of the great difficulty in shipping this material. Shipping companies have apparently experienced difficulty with previous consignments which they have carried.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Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Manufacture of carbonised fuel.—K. L. Storrs. Jan. 7, 1943. 20398/1947.

Causticising and lime recovery method and apparatus.—Traylor Engineering & Manufacturing Co. Feb. 20, 1946. 1940/1947.

Production of aldol and/or crotonaldehyde.—Usines de Melle. Feb. 18, 1946. 4646/1947.

Manufacture of a new polymerisable compound and polmerisation products therefrom.—Monsanto Chemical Co. Dec. 2, 1943. 23661/1944.

Green pigment compositions.—American Cyanamid Co. March 7, 1946. 952/1947

Methods and apparatus for producing cellulose xanthate.—American Viscose Corporation. Feb. 7, 1946. 21633/1946.

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Where Does Life Begin?

TO those engaged in the biological industries, the study of the smallest forms of life is commonplace. To many chemists who are used to inorganic chemistry or to the more mundane types of organic chemistry, there is an interest in biological chemistry that savours of the romance with which science is regarded by those who have the instinct for research, but lack the qualifications. Transcending all these subjects is that of the basis of life; where and how does the purely material end and matter containing life begin?

There are molecules that can be stated without doubt to be without life: sulphuric acid, benzole, anthracene, and going up the scale of atomic weight, the resins, and even those " vast " molecules of which plastics are composed. There are yet other molecules, or rather collections of molecules, which are obviously endowed with life. The smallest of these can be seen within our high-powered microscopes and, being too large to possess a brownian motion, yet move and are declared to have life, and on treatment with certain reagents they cease to move and are dead. On what ground are we sure that the smaller bacteria possess life? May not the action of the chemical reagent be to change the molecules so that they possess different properties?

These philosophical reflections, which may well excite the ridicule of the biochemist, have been engendered by reading the Cantor lectures on Enzymes delivered to the Royal Society of Arts, by Dr. J. A. V. Butler, and an article in a recent issue of *The Countryman*, "The World of the Infinitely Smaller," by Kenneth M. Smith, F.R.S.

Enzymes, these curious biological agents that bring about chemical changes in living matter outside the cell, were completely obscure until a very few years ago. During the past 20 years there has been an extraordinary widening of information. Enzymes have been recognised as proteins, and to that fact has been due much of the success with which they have been pursued by the chemist.

Proteins are highly complex nitrogenous substances always found in living matter, the most characteristic of vital substances, and yet they have no life themselves—so far as we have been able to recognise. About their chemical composition it has been established that they are largely composed of amino-acids, but just how the amino-acids are arranged to build up the molecule yet remains to be discovered. What is known is that the molecular weights of enzymes vary between the 15,000 of ribonuclease, the 48,000 of insulin, to the 15,000,000 to 20,000,000 of tobacco mosaic virus.

The proof that a protein consists of definite molecules, all of the same composition, is highly important. Svedberg's work with the ultra-centrifuge leading to this discovery has been described by Dr. Butler as " perhaps the most significant physico-chemical work of our time in its implications and in the tremendous field it has opened up. It not only established the natural unit of the most important constituent of living matter," he goes on to say, " but it also showed that organised chemical structures exist in profusion, of a

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much larger magnitude than had previously been suspected."

Study of crystals and of the tobacco mosaic virus as a molecule of high molecular weight brings us to Kenneth Smith's description of the world of the infinitely small. Here, as Smith says, quoting Aristotle, we reach that shadowy boundary in which nature makes so gradual a transition from the inanimate to the animate kingdom that the boundary lines between them are indistinct and doubtful. All virus particles are regarded as being alive.

Yet Smith can write: "Since the particles of many viruses are all of the same size and shape, it is legitimate to look upon them as molecules." Furthermore, he goes on to say: "Arising out of the isolation of viruses came the further discovery that several plant viruses could be obtained in pure crystalline form. Some were eight-sided and others twelve-sided, while others again formed thin crystalline plates. Just recently these thin virus crystals have been photographed under the electron microscope and . . . it is possible to see the actual arrangement of the virus particles in the crystal lattice. Thus, for the first time in history, we can see a molecule."

Are viruses alive? It may be that they are not. Scientists are undecided, although the modern trend is to regard them as living entities. This clearly is the province of the biochemist, but we are entitled to note a curious chemical property of certain very much larger aggregations of molecules that undoubtedly have life. The discovery of the sulphonamides opened up to science a whole class of substances, themselves undoubtedly inanimate, that can inhibit bacterial growth. Of this Dr. Butler says: "The reason for this inhibition was very obscure for a time; but a clue was found in the observation of Woods (1940) that p-amino-benzoic acid was antagonistic to this inhibitory action. The presence of a little amino-benboic acid prevents inhibition by sulphonamides. Now amino-benzoic acid is essential to the growth of many organisms. . . . Sulphanilamide, the simplest of these compounds, is a very close chemical analogue of p-amino-benzoic acid, having the sulphonamide group—SO_2NH_2—instead of the ordinary acidic group—COOH. Woods's theory was that the sulphanilamide impersonates the necessary amino-benzoic acid. It combines with the proteins or enzymes and co-enzymes of which the latter is the necessary constituent, but the enzyme containing the 'false' constituent is unable to carry out its functions properly; it is 'warped' and no longer makes a good fit with its substrate."

This analogy between chemical reactions and the mechanism of living things appears to have some extraordinary implications. We may be as far as ever from discovering why one minute aggregation of molecules is "alive" and another is inanimate. But at least we seem to have discovered a curious kind of no man's land in which the two can co-exist as molecules of constant composition of similar sizes. That no man's land may be the viruses. Scientific opinion suggests to-day that some viruses are alive and some are inanimate. We may be on the borderland of knowledge of what constitutes life.

NOTES AND COMMENTS

Scientists' Roll-Call

THE deep waters in which officialdom generally flounders in pursuit of its fundamental ideal of reducing the human element to a string of classified statistics are called to mind by the current attempt by the Technical and Scientific Register of the Ministry of Labour to count and sort into neat bundles this country's scientific manpower. In a spirit of optimism, which will not be widely shared, the Register is now broadcasting through a variety of channels a foolscap questionnaire of 14 parts in anticipation that scientists will identify and docket themselves, so that future requirements of scientific manpower, with which the Barlow Committee was lately so deeply engrossed, may be estimated with some accuracy. Something of this kind was of course inevitable if the " output " of scientists is to be regulated as are some more tractable materials. Our own view is that it cannot, but as there are manifestly not sufficient scientists for the needs of industry alone the Register is deserving of sympathy in the present Herculean undertaking which it has imposed on itself. In spite of Mr. Godfrey Ince's assurance on behalf of the Ministry, in a persuasive covering letter to scientists at large, "that the information that you provide will be treated in strict confidence and will not in any circumstances be used as a basis of any form of administrative control or direction . . .," we suspect the response will be no more enthusiastic than men of science generally accord to requests for potted biographies.

Mineral Wealth

NOW that the existence of a state of economic emergency is admitted in Government circles, as well as by more realistic sections of the community, the need for counting our resources has taken on special urgency. Two circumstances in our favour are that in the prosperous years relatively little use was made of substantial stores of indigenous materials and that Britain is better served than any other country in the matter of surveys. A timely and welcome reminder are the rather surprising revelations by the Geographical Survey Board of the scale on which British mineral resources are now being exploited. In the past, British minerals has usually been taken to mean coal. Actually, of course, the term embraces a wide range of basic materials whose value became abundantly apparent when the enemy blockade halted the accustomed influx from overseas. Now that the blockade is of the dollar variety the need is not less urgent and the work which the Geological Survey did in war should bear a second and continuing dividend. The fundamental importance of such work as the Survey Board's intensive study of the North Pennine orefield, to which reference is made in the newly issued 1945 Report (H.M.S.O., 9d. net), is proved by the successful exploitation of new sources of barytes. During the war the home production of barium minerals rose, as a result, by approximately 30 per cent—to 100,000 tons of barytes annually, of which the North Pennine field contributed nearly one-half. Another important contribution, of which the Survey Board was the instigator, had its genesis in a sampling campaign for zinc ore in the waste dumps in the Alston area, which resulted in the erection of a treatment plant with capacity of 1000 tons a day, and produced an invaluable source of zinc concentrates. These are but two instances of a long record of realistic enterprises which the Survey Board has carried out in support of the chemical and metal industries in time of need, which conferred, among other benefits, a plentiful supply of fluospar—basic requirement of the steel industry—from the North Pennines and Derbyshire, of potash feldspar and mica from Scotland and substantial supplies of bauxite from Northern Ireland.

International Red Tape

THE work of the Survey Board is representative of some of the more promising means of putting into the hands of industry the tools with which the overdue export job must be done. Yet another tool, it would seem, is equally urgently required just now—a keen edged tool in a determined hand to cut away the cocoon of red tape in which export traders, and chemical export traders more than most, are enmeshed. These are the documents commonly required to-day for the despatch of goods overseas : *Pro forma* invoice, import licence, export licence, packing list, export declaration, shipping permit, dock receipts, bill of lading, special customs invoice form, insurance certificate, letter of credit and bank draft, manifest. Even when that formidable range of obstacles has been cleared there is, under present unpredictable conditions here and overseas, no certainty that a shipment will then have a straight run. "Even in one and the same country"—notes the International Chamber of Commerce—"regulations sometimes change with such rapidity that the customs officials themselves are unable to keep pace; opening and closing hours of customs houses are often not the same on both sides of the frontier." In the light of these and a host of similar booby traps to which the I.T.C. is calling attention some sympathy is due to the chemical export trader evincing lukewarm enthusiasm for the export campaign. Half these impediments to international exchanges are fundamentally unnecessary, and in the view of the I.T.C. all parties to overseas transactions would be adequately protected and administrative requirements fulfilled by three documents from the consignor: A bill of lading or consignment note, the commercial invoice and the packing list, with a manifest from the carrier by air or sea transport. The I.T.C. seems to have presented, without being asked, an opportunity for the International Trade Organisation to further its principal aim to everybody's benefit—excluding only the home and foreign armies of redundant government officials.

Guido Donegani

NOW that it is possible to see the principal figures in foreign chemical industry undistorted by the prejudices and propaganda of the war period, fresh estimations have to be made, in which the reputations of some ex-enemies are blackened still more by what is revealed, while the imposing stature of some others is now apparent for the first time in many years. To the latter category belonged Guido Donegani, whose achievements as father of the present-day Italian chemical industry and many ancillary activities the brief obituary notices published when he died paid inadequate recognition. Much of the picture has now been filled in (in *La Chim. e l'Ind.*, 1947, *29*, 133-136) by a colleague, Giacomo Fauser, who reveals the phenomenal drive and vision which permitted Donegani to build from the little mining firm of Montecatini di Val di Cecina, one of the world's leading chemical undertakings, upon which depended much of Italy's emergence from a nation of picturesque agriculturists, and much of the modern development of minerals and hydro-electric power. Fauser now gives something of the full story of Montecatini's impressive advance into most fields of chemical and allied industry: mining of copper, lead, zinc, iron, sulphur, marble, etc. nitrogen fixation and synthetics; calcium carbide and electrochemical industry, and chemicals based on carbide; aluminium and light alloys, dyes, intermediates, plastics. Donegani inevitably shared fully in the condemnation heaped on trusts and cartels, but, as Fauser remarks, it is self-evident that the greatest progress in chemical industry both in Italy and abroad has been made where it is concentrated in a few hands. Only a relatively small group, well organised and possessing ample financial resources can sustain the heavy cost of research and development. Donegani, it seems, was not the financial tycoon his critics would have one believe; he held barely 7 per cent of the shares of the Montecatini "empire." With characteristic courage, he stayed by his country to the last and his experiences as a prisoner of the Nazi SS after the Italian armistice hastened his end.

Chile's Copper Trade

Dollar Shortage Fears

COPPER, which has long been one of Chile's largest export items, is expected to make a considerable contribution to the country's foreign exchange during the current year. Almost the entire production is under the control of American companies and sales are effected in dollars. Although exports to the U.S.A. have been considerably reduced since the war, exports have been maintained at a relatively high level because of a resumption of trade with European countries. With regard to the future, however, the world shortage of dollars, if it continues, may adversely affect Chile's copper trade. For instance, during the past twelve months, the United Kingdom is understood to have purchased Chilean copper valued at £7 to £8 millions, payable in U.S. currency. These purchases, it is thought, will now cease owing to the shortage of dollar exchange.

New Chemical Laboratory for R.A.E.

Important Progress in Rocket Fuels

THE official opening of the new chemical and physical laboratory of the Royal Aircraft Establishment at Farnborough, manifests the great importance which the Government attaches to aviation research and development and in particular the leading rôle that chemistry will be called upon to play in its advancement. This was the substance of the address which Mr. G. R. Strauss, Minister of Supply, gave before a large audience of R.A.E. personnel and Press representatives in the conference room of the new building last week.

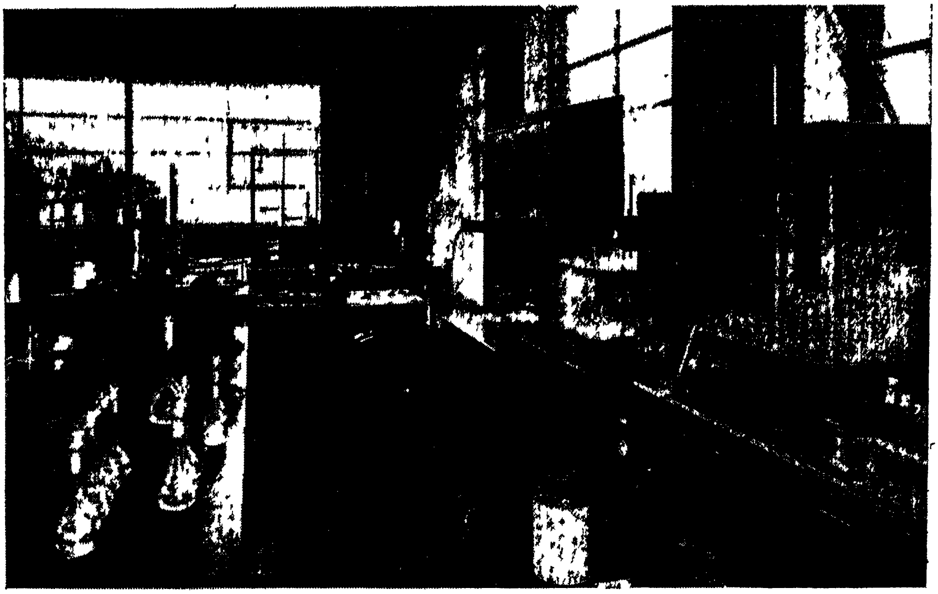
Proceedings commenced with an introductory speech by Dr. W. G. Perring, chief superintendent, who described the work of the Establishment since its inception in the years preceding World War I, when aviation was in its infancy. He paid tributes to valuable assistance rendered by Prof. Sir Ian Heilbron, in the early design stages of the project. Other well-known names mentioned in the same connection were Dr. J. O. Hughes (head of the chemistry department), Dr. Ramsbottom, and Prof. Wynne-Jones. Dr. Hughes later outlined much of the programme in hand, mentioning work in progress on plastics wings, new fuels for rocket motors, glues, fire prevention, toxicity of gases, etc.

Visitors subsequently broke up into small parties and toured the various laboratories at will.

Among the laboratories inspected were those concerned with rheology, lubrication, paints and dopes, plastics, wood and adhesives, rubber, radiography, gas analysis, crystallography, refrigeration and rocket fuels. A particularly interesting piece of apparatus in the last mentioned department is used for experiments with the use of methyl alcohol/80 per cent hydrogen peroxide for rocket fuels—as a demonstration showed. The two liquids ignite spontaneously upon coming together.

On the possibility of using higher concentrations of hydrogen peroxide, a technician informed THE CHEMICAL AGE that concentrations of up to 90 per cent could (with care) be safely handled at the moment, but that higher concentrations up to the 100 maximum required a technique which the establishment had yet to perfect.

Contained in a typically modern 3-storey building on a 4-acre site, away from the dust and much of the noise of the airfield, the laboratories are equipped with the latest scientific apparatus; floor space amounts to about 40,000 sq. ft. The general lay-out and appointments of the laboratories fully confirmed that Mr. Strauss's belief that "chemists can work best when they have comfortable surroundings" is to be implemented here.



Part of the plastics laboratory at Farnborough

GERMAN CHEMICAL REVIVAL?

NO LARGE-SCALE PRODUCTION BEFORE 1949

THE prospects of revival of German chemical industry and the re-establishment of part of the country's great pre-war activity in world markets are the subject of a detailed study, from the German viewpoint, in the *Hamburger Allgemeine Zeitung*. Nostalgically, it is recalled that, before the war, German industrial chemical undertakings led the world in spite of Anglo-American competition. Germany kept her dominating position throughout World War I and even during the slump of 1930-1933 increased her production and exports. Her share in the world trade rose from 26.1 per cent in 1929, to 28.3 per cent in 1933 and her dominance was maintained until the last war.

Past Achievements

Germany's share of the world export of ammonium sulphate, however, dropped from 40 per cent in 1929 to 19 per cent in 1937, but the share in the participation in the remunerative exports of dyestuffs, and of pharmaceutical and other organic chemical products, increased in the same period from 37 and 31 per cent to 41 and 37 per cent, respectively. These facts are recalled as a token of Germany's chemical industry's capacity gradually to recover again.

Meanwhile, the authorities have limited German production of chemical raw materials to 40 per cent of pre-war level, of dyestuffs, pharmaceuticals and artificial fibres to 80 per cent and of other chemical products to 70 per cent; these targets are very unlikely to be reached before 1949 on account of the great war destruction. And exports of chemical products will be reduced even more severely than production. The Allied economic plan provides for no export at all of chemical raw materials and some finished and semi-finished products, including heavy chemicals and fertilisers, which before the war were of great importance.

Scope for Drugs

The export of dyestuffs, which before the war represented a value of Rm. 200 to 336 million, will be allowed only to reach the value of Rm.58 million, in the fixed ratio to the value of 1936, whereas the export of pharmaceutical products, also based upon the 1936 figure of Rm.125 million, is fixed at Rm.120 million. This apparent concession can be explained by the fact that the demand for German medicaments and specialities is still great and that, in spite of the confiscation of German patents, it is not generally practicable to exploit them abroad.

It is expected that the new industrial plan may fairly shortly permit the export of heavy and industrial chemicals which are at present scarce in England and the U.S.A.

German dyestuffs and pharmaceutical products, it is pointed out, are in steady demand everywhere, but the supply is very much hampered by the lack of overseas sales organisations and by the need of foreign currency or credits. The present division of Germany into four zones is also a great hindrance.

The 80 chemical works in the Soviet zone of Berlin are quite cut off from the world market. The importation of raw materials, such as boron, iodine, camphor, vegetable drugs and medicinal herbs all of which formerly came from abroad, is now impossible, and the materials upon which the production of ointments and plasters depends is mainly concentrated in Hamburg.

Exchange Requirements

The total of foreign exchange required, the *Hamburger Zeitung* points out, is, however, not very great. It formerly represented only 1 per cent of the proceeds of export transactions and would now be 2-3 per cent, on account of the general increase of prices of raw materials. An export value of Rm.120 million would thus require only Rm.3.6 million in foreign exchange. Double this amount would be necessary for imported raw materials for the home demand for pharmaceutical products. At present the great difficulty, says the *Zeitung*, is to procure sugar, alcohol, starch, ampoules and medicine bottles, which formerly came from places now in the Russian zone, and which are lacking in the Western zone, where the great pharmaceutical industry is located.

German Chemical Production.—The Chemical Works at Dessau have succeeded in stepping up production of ceresin to 120 tons a month and a further increase to 200 tons is planned. The same firm is endeavouring to produce sufficient quantities to allow inter-zonal trade in this commodity. The Hydrating Works at Rottleben, Soviet Zone, produces Lanette-wax and Ceticol-Extra as basic materials for ointments. The soap factory "Palmolive" Binder & Ketels G.m.b.H. at Hamburg-Billbrock, British Zone, have resumed production with half the number of their pre-war staff. The products will go to Hamburg and Schleswig-Holstein. The Alabaster-Gypsum Works at Cologne, also in the British zone, have again taken up the production of medical gypsum for hospitals, laboratories and dentists.

Appointments in Chemistry

50 Poles on Ministry's Register

THE Technical and Scientific Register, a wartime instrument set up by the Ministry of Labour and National Service to place qualified chemists, chemical engineers and others in suitable employment is still actively in existence, and contains the names of some 450-600 useful men between the ages of 25-65. This information was given to THE CHEMICAL AGE this week by a Ministry of Labour official in a personal interview.

There are two categories of applicants, viz., (1) Englishmen (about 450 in number) of from 40 to 65 years, mostly in employment but seeking better paid posts at salaries ranging upwards from £400 per annum (the figure, of course, depends upon qualifications); (2) Poles who have enrolled in the Resettlement Corps. These men, of whom there are about 50, varying in age from 33-40. Generally speaking, these candidates joined the Polish Forces immediately after graduating—they have had, in most cases, little or no industrial experience. They are asking for relatively small commencing salaries and agree to be treated as trainees

It is emphasised that these Poles desire to remain in this country and will in most cases ultimately apply for British nationality.

Younger Men Preferred

The Ministry of Labour has stated, some difficulty is being experienced in placing these men in suitable employment. It appears that employers are seeking younger men just leaving universities and colleges. This is a policy which though possessing merits of economy, may have been occasioned from lack of knowledge of alternative sources of suitable personnel. At all events, here is a pool of labour that should help to ease the shortage of qualified chemists which may arise when the large scale plans for expansion of a number of chemical industries go into production.

Benzene Explosion Inquest

EVIDENCE that the explosion which occurred at the chemical works of Messrs. A. Boake Roberts & Co., Ltd., on October 17 (THE CHEMICAL AGE, October 25) could have been caused by a spark from a boot nail coming into contact with escaping benzene vapour, was given at the inquest on the three victims of the explosion on Tuesday.

The witness was Mr. F. Andrews, plant manager, who said he had no doubt that benzene vapour was escaping from three absorbers. He added that he was unable to suggest the actual point of ignition, and there was nothing to indicate the cause. Every precaution had been taken.

U.S. Lead Output Slumps

14 Per Cent Less in 1946

LEAD production from domestic mines in the U.S.A. dropped 14 per cent in 1946, and, for the first year on record, was exceeded by the smelter production of secondary lead, according to final figures just released by the Bureau of Mines, U.S. Department of the Interior. The supply of refined lead available for consumption continued to decline despite an advance in price to an unprecedented 12.55 cents per lb. at the year's end. Domestic mine production of lead and refinery output from domestic ores and base bullion declined to the lowest levels since 1935 and 1933, respectively.

Lowest Imports

Total output of refined lead at primary refineries fell 25 per cent to 346,200 tons, against 462,100 tons in 1945, and antimonial lead production decreased 11 per cent. Imports of lead-bearing materials urgently needed to offset the decreasing mine output dropped to the lowest level since 1939.

Among the factors said to have restricted production during the year were prolonged labour strikes and shortages and uncertainty regarding extension of price controls and ceiling prices; and the consequent unstable price structure during the month when the Office of Price Administration was inoperative. Ceiling prices on virtually all commodities, including lead, were removed in November.

Lead continued under Government control during most of 1946 through provision of Civilian Production Administration General Preference Order M-38, prohibiting the use of lead for certain purposes. This Order was revoked, at the instance of the great majority of the lead producing and consuming industries, on December 27, 1946, thus virtually ending the Governmental control of lead which began in October, 1941. Subsidy payments under the Premium Price Plan for over-quota production remained in force through June but collapsed with the expiration of OPA and ceiling prices

Consumption and Imports

A survey of 575 plants in 1946 representing an estimated 98 per cent of the consumers indicated a total consumption of 520,525 short tons of refined lead, a decrease of 18 per cent from 1945. Of the total, 25 per cent was used for making red lead and litharge.

Imports during 1946 dropped to the lowest level since 1939 and were 68 per cent below the record total of 1942. Forty-eight per cent of the pigs and bars came from Mexico and virtually all the remainder from Canada, Peru, Japan and Australia. Receipts of lead in ore and matte, which constituted 28 per cent of the total imports, were 37 per cent below the 1945 level.

WORLD TIN ALLOCATIONS ANNOUNCED

This Year's Final Distribution by Countries

THE Ministry of Supply announces that the Combined Tin Committee has made the final allocation of tin metal for the second half 1947, amounting to 11,085 long tons. This allocation is in addition to that of 11,331 tons announced July 8, 15,710 tons announced August 21, and approved since the last formal meeting of the committee. (THE CHEMICAL AGE, July 12, August 30, and October 4,) Total allocations to date amount to 38,857 tons. For most countries, the allocations shown below will be final for the second half of 1947. Certain countries, however, may receive additional grants in the near future.

Improved Supplies

Present allocations are somewhat higher than had been predicted in August owing to a moderate increase in quantities available for export from the producing countries. Except for a small reserve to cover the revised allocations noted above, all visible supplies for the half year have now been allocated. Although the rate of production of tin metal is increasing, says the Ministry, the total new supplies still fall considerably short of requirements.

FINAL TIN ALLOCATIONS

Country	Previously approved	New	Total
Argentina	—	75	75
Australia	425	100	525
Austria	97	51	148
Brazil	100	—	100
Canada	1,000	525	1,525
Ceylon	26	22	48
Chile	49	—	49
Czechoslovakia ...	508	224	732
Denmark	165	60	225
Egypt	110	40	150
Finland	72	31	103
France	4,115	1,210	5,325
Germany	1	99	100
Hong Kong	52	61	113
Hungary	203	—	203
India	3,263	651	3,914
Ireland	25	5	30
Italy	657	—	657
Newfoundland ...	5	—	5
New Zealand	296	80	376
Norway	141	51	192
Palestine	82	31	113
Philippines	4	14	18
Poland	241	197	438
Sweden	493	200	693
Switzerland	522	—	522
Turkey	186	74	260
U.S.A.	14,657	7,143	21,800
Uruguay	41	4	45
Yugoslavia	116	57	173
Other South American and Middle East Countries	120	80	200
Totals ...	27,772	11,085	38,857

Sources of supply are as follows: The United Kingdom (on behalf of Malaya), Hong Kong, the Netherlands, Belgium, China, Siam, and the United States (for Japanese tin). In addition, small demands of certain Latin American and Middle-Eastern countries may be met from British, Belgium, Netherlands and United States sources.

The Ministry also states that the Combined Tin Committee has decided not to make allocations to individual countries within the block tonnage allocated to "Other South American and Middle East countries."

U.K. Stocks

Figures issued by the Ministry of Supply relating to the U.K. tin position for September, show that stocks of tin metal held by the Ministry and consumers at September 1 amounted to 9700 (long) tons, or nearly 500 tons more than on August 1. Consumption during September also rose to 2376 tons compared with 1674 tons during August. Stocks at the end of September were: Ministry, 6387 tons; consumers, 3082 tons. Stocks of tin ore fell during the month from 7434 tons to 6038 tons.

Over Half for U.S.A.

A consideration of the final world allocations reveals that allocations to the U.S.A. amount to well over half the quantities of tin available. It has been suggested unofficially, that the U.S.A. is stockpiling, regardless of the conditions of acute world shortage. An additional factor to be considered is that the U.S.A. is not possessed of substantial tin ore deposits. In 1944, for example, only 5.4 long tons were produced in the 8 tin-ore producing states, viz., South Dakota, Alaska, Montana, New Mexico, Alabama, California, Nevada, and North Carolina. Output from U.S. tin smelters in 1944 amounted to 30,884 long tons, a figure which suggests that peacetime consumption of tin is either considerably higher than that in wartime (which seems unlikely) or stocks are being increased as insurance against some future emergency or a continued shortage.

If it is accepted that the U.S.A. will take all the tin she can get, it seems unlikely that the elimination of American tin subsidies, associated with current tariff arrangements, will greatly benefit Malayan producers—particularly during the current world scarcity. The full text of the tariff agreement will be published on November 18.

PRINCIPLES OF PRESSURE SPRAY NOZZLES—III

Viscosity and Nozzle Capacity

by H. L. M. LARCOMBE

If we take the term "capacity" of a nozzle to indicate the volume of liquid passed, then the actual viscosity of a fluid does not affect the capacity of a nozzle quite so much as it affects the spray form and the droplet-creating quality of the nozzle. To maintain capacity with a more viscous liquid than water will require a higher pressure at the nozzle, but this pressure will be found to be not quite so great as it would first appear. This will depend to some extent on the construction of the nozzle.

First, if the nozzle is of a design which has small dimension passages in its construction, such as the Merrell-Soule nozzle (U.S. Pat. No. 1,183,393), the passages are actually part of the liquid path and will offer more resistance to the flow of a high viscosity liquid than a low viscosity one.

Second, if a nozzle has a spin-chamber where the liquid is given swirl before passing through the orifice an increased pressure must be exerted to supply the additional energy to impart this turbulence to the more viscous fluid.

Where a nozzle has no internal passages but comprises a relatively thin orifice plate (Fig. 7) the additional pressure required for a highly viscous fluid is very small indeed, as the main loss is the exit loss which is not influenced by viscosity until certain conditions obtain which are usually not within the range of normal spray nozzle application.

Main Function of Nozzles

The function of emitting a volume of fluid is, however, not all that is required of a spray nozzle. The main function of a nozzle is to break down the fluid into droplets and it is this ability to form droplets that is affected by increased viscosity much more than its ability to pass a given volume of fluid.

It can be shown that at any given pressure the capacity of a nozzle determined when passing water is not very greatly reduced when a more viscous liquid is passed, but the quality of the spray deteriorates very noticeably; indeed, the issuing fluid may pass as a disturbed jet only and not rupture into droplets to any appreciable extent.

The question of additional pressure for a more viscous fluid is therefore usually not so much a matter of maintaining volume passed—"capacity"—as maintaining a useful spray form and a good drop size distribution. It is, therefore, good policy to ensure that fluids to be passed through a spray nozzle have a viscosity as low as possible, even to the extent of heating them before spraying.

In studying the question of nozzle design and its influence on the pressure-capacity-viscosity relationship it should first be clearly understood that the actual breaking down of the fluid into droplets does *not* usually take place inside the nozzle, but only after the initiating element, whether it be of the filament or thread type, has actually left the nozzle.

Effect of Increased Viscosity

Because of this any increase in viscosity will, to some degree, increase the pressure which has to be exerted because the whole of the orifice to the tip of the nozzle can be considered as part of the conduit through which the fluid has to pass. The simple orifice at the end of the supply line will, therefore, have least effect on the pressure, as the losses are much the same as with water. (The length of the orifice should be kept as short as possible compatible with wear.)

Although the author is aware of no actual tests on simple orifice spray nozzles carried out to determine the limit beyond which viscosity does affect the pressure, the formula given by the Foxboro Co. for flow meter orifices can be used as a check. These state that viscosity can be ignored until the following expression is proved to apply.[4, 5]

$$\frac{W_h}{d\ t_s\ G_f} \text{ is greater than } 2770$$

$$\frac{V^h}{d\ t_s}$$

W_h = Rate of flow in pounds/hour.
V_h = Rate of flow in gallons/hour.
d = Orifice diameter in inches.
t_s = 465 × kinematic viscosity in c.g.s. units
G_f = Specific gravity of flowing liquid.

To understand the full effect of viscosity on the capacity of nozzles, other than a simple orifice at the end of the pipe, the influence of the degree of turbulence existing on the liquid before it leaves the orifice should be understood.

Turbulence is a measure of the Reynolds

Number of the flow and in this application has two main aspects.

(a) In highly turbulent flows the orifices have better drop-forming powers than with a less turbulent, more viscous flow. (Water with a high Reynolds Number and high turbulence gives a better spray quality than a highly viscous jet with a low Reynolds Number).

(b) The degree of turbulence is a measure of the viscosity of the fluid and a measure of the Reynolds Number, all other factors being constant, and also a measure of the friction loss and consequently the pressure required for a given flow quantity.

Importance of Turbulence

It will be seen, therefore, that the degree of turbulence in the orifice as indicated by the Reynolds Number is of importance from two points of view: of spray quality and also of maintenance of quantity of fluid passed.

Therefore, after allowing for surface tension, one simple way to maintain the quality of spray and the quantity passed when spraying a viscous fluid is to establish a similar dimensionless number to Reynolds Number for the water flow through the nozzle and find what pressure is required to establish a similar number using the higher viscosity.

As the dimension factor in Reynolds Number is constant and, assuming the velocity through the nozzle to be the same for equal volumes, the figure required is a function of specific gravity and the absolute viscosity, *i.e.*, the kinematic viscosity.

However, as the flow is in the turbulent range of flow, the relationship between the friction factor and Reynolds Number does not follow a straight line law. A curve shown in Fig. 9 gives information which will prove of use in giving the factor which can be used to find the variation in pressure required for various viscosities.

Nozzle Designs

The centre jet type of nozzle gives a solid cone spray form with fairly uniform distribution over the entire area covered. The section view in Fig. 1 showed the action inside the nozzle. The major portion of the stream passes through the annulus vanes and is given a rapid swirling motion. The remainder of the liquid passes straight through the centre jet and impinges on the liquid mass just upstream of the orifice, causing the liquid to issue from the orifice in a full cone spray. It gives a good spray at relatively low pressures.

The centre vaned portion is a press fit in the main nozzle shell which allows a good vane to be employed and also allows replacement when necessary. It can be manufactured in any metal or alloy, vulcanite or plastic. A nozzle similar to this is patented in the U.S.A. by the Spray Engineering Co.

The angle of the cone varies with orifice size and pressure. The apex angle of the cone for constant orifice size increases with increased pressure, reaching a maximum which is maintained constant even when pressure increases.

In certain cases the apex angle is reduced if pressure is increased after the desirable maximum is reached. This is due to an increase in the axial component of the flow relative to the rotary component. This variation in angle was shown in Fig. 4. Owing to the wide use of this nozzle in spray ponds the usual heights of the spray were also given in Fig. 4.

Spiral or Ramp Bottom Type

This type gives a hollow cone spray form and is especially suitable for water containing solid matter such as slurries and industrial waste effluents. This is a centrifugal nozzle which has an advantage over other nozzles of this type, inasmuch as it has no narrow internal passages which would become blocked by foreign matter. The spin chamber is large and the inlet to the chamber is approximately half the area of the pipe leading to the nozzle. Such nozzles can be manufactured in any metal or alloy, vulcanite or plastic. A nozzle of this design is marketed by Spray Engineering Co. in U.S.A. and by Ledworth & Becket in this country.

The angle of the cone increases with increased pressure to a maximum and then remains constant.

This gives a hollow cone spray form and

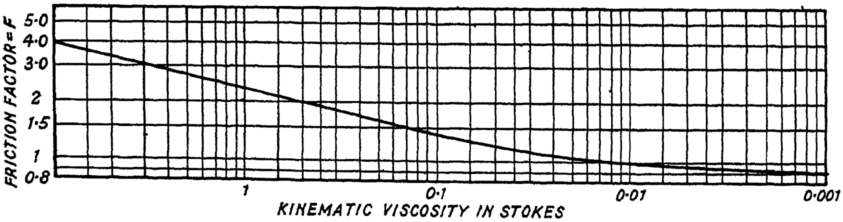


Fig. 9. Pressure required to maintain water capacity at increased viscosity = pressure for water × F

will give very consistent results. It will pass any material small enough to pass the inlet port and can be manufactured in any metal or alloy and can be used at very high nozzle pressures. The apex angle increases with increased pressure to a maximum and there remains constant.

This nozzle has an advantage that it can be manufactured at quite low cost and allows orifice replacement. The inlet port into the spin chamber should be equal to, and never less than, the orifice.

Flat Spray Type

This gives a flat fan shaped spray form and will operate with any material small enough to pass the orifice. The angle of the spray increases with increased pressure to a maximum and there remains constant. The drop size distribution of this nozzle is not consistent across the angle of the spray plane. The outer "horns" of the spray are a source of very large, probably recombined, drop but normally this spray is not used for applications which demand close droplet size control.

It is a very good nozzle for producing jets capable of doing physical work, cleansing or descaling.

The misting type is a low capacity nozzle which produces such small droplets that no definite spray form is evident. The droplets have little inertia and are immediately carried in the prevailing air current. The small orifice is usually drilled in a sapphire inserted in the tip of the nozzle. To prevent the orifice becoming clogged a fine gauze screen is mounted as an integral part of the nozzle. These nozzles can be used for many purposes which require low capacity and fine atomisation, such as applying perfume to cosmetics.

Conclusion

Perhaps the greatest unknown factor in spray nozzle design is the drop size distribution and how it is affected by nozzle construction and other variables. Any work which will advance our knowledge on this point will help to bridge a large gap in the work of applying spray nozzles efficiently. Such work would necessarily have to include work on recombination and coalescence.

Nozzle types as shown in Fig. 1, in order of suitability are: Cooling circulating water of condensers, 4, 1, 3; aerating water supplies, 4, 1, 3; spraying brine for refrigeration purposes, 4, 1; quenching coke and pig iron, 4; washing coal, sand and gravel, 4, 1; beating down foam in paper manufacture, 4, 5; chemical processes requiring large free area, 4; distributing oil over fuel beds in gas machines, 4, 2; manufacturing salt by spray evaporation, 4; enriching gas with liquid distillate, 1, 2; scrubbing and gas washing, 1, 2; humidification, 6, 1, 3; applying asphalt to roads, 1, 5; settling dust in ash pits, bins, etc., 1, 2; descaling hot steel billets, 5; cleansing wire screens and felts on paper machines, 5; cooling rubber mill rolls, 5; cleaning moulds, 5; washing rolling stock, 5, 4; applying anti-rust to metal sheets, 5; washing metals after pickling, 5; applying weed-killers on railway roadbeds, 5; spray drying, 1, 2, 4.

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(Concluded)

U.S. Mineral Reserves

Bureau of Mines' Wartime Activities

RESULTS of exploratory work conducted by the Bureau of Mines on mineral deposits in Wisconsin and Wyoming are described in two separate publications just released. The studies disclose valuable information on the U.S. mineral resources as well as materially assist the conservation of domestic supplies of essential metals. The two reports are entitled: Report of Investigations 4090, "Winskell-Andrews-Lyne Zinc Deposits, Lafayette County, Wis." and Report 4089, "Good Fortune Iron Mine, Platte County, Mo."

Copper Deposits

As a result of the U.S. Bureau of Mines' wartime investigation of an extensive Arizona deposit of ore containing 0.8 per cent copper, reserves of copper are now known to be larger than was previously thought. The San Manuel deposits in Pinal County have proved to contain large reserves. Drilling has indicated the existence of about 30 million tons of ore, and further drilling in the same area by private enterprise has increased this estimate 14-fold, and plans are under-way for immediate development. Although the San Manuel deposit was first located in 1870, little work was done on the property until 1916. Work was soon stopped, however, and was not resumed until the Bureau began its investigation in 1943. Plans are reported to have been drawn up to mine 25,000 tons of ore daily.

American Chemical Notebook

From Our New York Correspondent

A SCIENTIFIC mission is shortly to be set up at the U.S. Embassy in London, where it will direct the exchange of scientific information and personnel between the United States and Great Britain, and generally develop and maintain close contact with Government and other research institutions in the U.K. Leading the mission—of scientists and engineers—will be Prof. Earl A. Evans, Jnr., a 37-year-old American biochemist who is chairman of the department of biochemistry at the University of Chicago.

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Two German methods for the production of chlorinated high molecular weight polyvinyl chloride resin, for adhesives, lacquers, fibres and other purposes are described in a report prepared by Clayton F. Reubensaal and just placed on sale by the U.S. Department of Commerce. The report (P.B. 77677) was prepared by Mr. Reubensaal following investigation and study of the processes used at the Bitterfeld and Rheinfelden plants of I.G. Farbenindustrie. Chlorinated polyvinyl chloride—"PC" to U.S. industry—retains much of its tensile strength up to 80° C., the report states, when used in the form of fibres. It is more crystalline than polyvinyl chloride and produces higher percentage increases in tensile strength when stretched. Though it deteriorates in strong sunlight, it is especially resistant to acids, alkalis, water, and fungus, and is also non-inflammable. These properties make it particularly suitable for use in filter cloth, rot-resistant fabrics, non-burning parachute cloth, industrial clothing, brush bristle, chemical ropes and fibres. For lacquers, some soluble types of chlorinated polyvinyl chloride are dissolved in trichloroethylene, ethylene dichloride, and mixtures of the lower alkyl acetate esters. Other solvents are used to prepare chemically resistant adhesives for general use. Inseparable bonds are obtained when methylene chloride solutions of PV are used as adhesives for plasticised polyvinyl chloride—shoe soles are an example.

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Chlorinated polyvinyl chloride, however, does not lack some disadvantages. Two inherent objections against PC are its relatively low melting point and its instability in light and heat. The I.G. Farben researchers tried to overcome the low melting point problem by the chlorination of copolymers of vinyl chloride but the work was dropped because of the great expense. The problem of instability was partially overcome by the development of hydrogen chloride, dioxdiethyl sulphide, thiodiglycol, and other glyceral derivatives as stabilisers. Both the Bitterfeld and Rheinfelden plants used a solvent process for making chlorinated polyvinyl chloride but a suspension method was so successful that it was scheduled to become the method used for plant expansion.

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The Ancelle plant of the Celanese Corporation of America, Cumberland, Maryland, is shipping celanese acetate to British Celanese, Ltd., to enable the British company to maintain production. This statement came from Mr. Fred T. Small, company vice-president and plant manager. Several tons, he said, had already been shipped, and no schedule for shipments has been drawn up, since the acetate is sent when shipping space is available. The shipments are being made as a result of a fire which damaged the British Celanese plant and curtailed the production of acetate. The acetate being shipped comes from inventory stock and is not hampering American production.

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A new synthetic fibre, Saran fibre, derived from Saran plastic by the Dow Chemical Company, promises to become the most important synthetic textile raw material since the development of nylon. The Dow Chemical plastic has already been used with success in the manufacturing of such items as screening, upholstery and women's handbags and hats. Resistant to moisture, flame, rot and mildew, the plastic is now being spun into ultra-fine fibres which can be made into gossamer-sheer fabrics. One successful application of the new synthetic fibre has been its use by the Columbian Rope Company, Auburn, N.Y., for the manufacture of acid-resistant rope. The first fabrics that will be made from this synthetic material will go into the manufacture of draperies and upholstery and it is suggested that it will eventually find its way into clothing, blended with other fibres, both natural and synthetic Saran absorbs less moisture than nylon and is regarded probably as being particularly well suited for raincoats. Although it will melt at high temperatures, it will not flame. Chemically called vinylidene chloride, Saran's raw materials are petroleum and chlorine gas. Because it contains so much low-cost chlorine, it is one of the cheapest of plastics and may eventually become one of the low-priced textile fibres. It will almost certainly be cheaper than nylon.

GELLING OF NITROCELLULOSE

Detailed Studies of Absorption Processes

IN a paper read at a meeting of the Centre de Perfectionnement Technique, Paris, Mlle. Thérèse Petitpas, D.Sc., describes recent work, including her own, on the gelling of nitrocellulose (*Chim. et Ind.*, 1947, *58* (7), 17-23). Among the cellulose esters, the nitrate is very convenient for study owing to the presence of the $O\text{-}NO_2$ group which, being extremely reactive, permits the use of various types of gelling agents.

First, J. Desmaroux in 1922-1930 studied the absorption by nitrocellulose of three types of gelatinisers: substituted ureas, camphor, and alkyl nitrates. (*Mém. Poudres*, 1923, *20*, 70; 1928, *23*, 54; 1930, *24*, 86; 1930, *24*, 211) and obtained two different absorption curves: with the nitrates he found, absorption nearly uniform and the curve nearly approaches a straight line; but with camphor or the ureas the curve was irregular and discontinuous. These results formed the starting point for subsequent research.

X-Ray Studies

The work of Hess and co-workers is next considered, including results of X-ray structure examination, and the action of cyclohexanone on tri-acetyl cellulose. Other agents used were methanol-cyclohexanone mixture, camphor-methanol, and acetone. (*Z. phys. Chem.*, 1929, *5*, 161; 1930, *7*, 16-7), etc.

Although Hess published many papers on his X-ray studies, Dr. Peptitpas points out that there did not appear to be equilibrium between the fibre and the gelling medium. Structure was therefore examined in the solid phase, of which the composition was imperfectly known.

Desmaroux, with Mathieu, resumed work in this field (Gelling of nitrocellulose, *Actualités scientif*, Hermann, ed. 1936, Thèse, Paris, 1936; Thérèse Petitpas, *Mém. Serv. Chim. Etat*, 1943, Thèse, Paris, 1943). Gelling and solubility were investigated from the point of view of both structure and thermodynamics. X-ray studies of the latter have since been well defined and precise composition has been known. Calorimetric measurements have permitted precise observation of heat phenomena accompanying absorption (E. Calvet, *C.R. Acad. Sci.*, 1941, *212*, 213; 1942, *215*; 1943, *217*); also birefrigent measurement (S. Perrier et M. Mathieu, *C.R. Acad. Sci.*, 1942, *214*) and study of mechanical properties (Madeleine Raisou et M. Mathieu, *loc. cit.*, 1941, *212*) have made it possible to define precisely the plastic phases obtained. Density measurements have assisted in the same direction.

Dr. Petitpas has therefore been led to classify gelling agents as (1) those which during absorption modify crystalline structure as revealed by X-ray study; and (2) those which do not modify structure. The first class include the ketones—acetone, cyclopentanone—alkyl acetates, and also camphor. To the second class belong alkyl nitrates.

Her experiments were made with well orientated nitroramie fibres to facilitate X-ray examination, and represented either dinitro- or trinitrocellulose. The fibres were submitted either to vapours from solutions of gelling agent in castor oil, or immersed in solutions of the agent in inert solvents.

It was not possible to use as variable in defining the system the degree of concentration of solution, as solution was not complete or perfect. Results, therefore, are expressed in terms of molecular concentration of gelling agent in the nitrocellulose as modified by or in relation to number of molecules of gelling agent absorbed by the number of C_6 groups. Activities could also be measured from vapour tensions as functions of concentration.

In the vapour phase measure of absorption is easy, for it suffices merely to weigh the fibres before and after. In liquid medium the indirect method, of change of concentration of solution used for soaking the fibres, was adopted. Tests were made at a temperature of 40° C., and two or three weeks were allowed to elapse in order to be sure of an equilibrium stage. With gelling agents which are also good solvents, equilibrium is quickly attained. The X-ray diagrams were also obtained from the equilibrium state with the liquid or vapour at 40° C., using special thermostatic chambers. The type used for study in the vapour phase is described and illustrated, and reference made also to the work of McBain in 1933 on vapour absorption by nitrocellulose (*Trans. Far. Soc.*, 1933, *29*, 1086).

No True Combination

Absorption curves are shown for various solvents or gelling agents: ketones, esters, nitrates, and camphor. It is concluded that these studies of structure confirm earlier work; but whereas, hitherto, it has been supposed that there was some form of chemical combination, more recent work tends to indicate that, strictly, there is no real combination—even when there is a change in diagram—but merely a greater or less degree of penetration according to the nature and structure of the gelling agent which attaches itself to a greater or less

(*Continued overleaf*)

U.S. Chemical Prices

Only 16% Increase: Du Pont Chairman

WRITING in the "North American Supplement" to *The Financial Times* of November 3, Mr. W. S. Carpenter, jnr. (president of Du Pont de Nemours & Co.) says that production of industrial chemicals during the third quarter of the year had been at a rate of more than three times the 1935-39 average and even greater than the wartime peak figure. He says that there has been a broadening of public acceptance of products of chemical processes, and claims that if future expansion of U.S. chemical industry depended solely on solving technological problems and winning public approval for its products, the outlook would be bright. But restraints and uncertainties abound such as shortages of building materials, and high costs.

Between 1939 and 1947, wages in the industry have risen by more than 60 per cent, while the price index of the major raw materials rose by 132 per cent. Despite these rises, the price index of chemical products, he claims, rose by only 16 per cent. Mr. Carpenter attributes the relatively small advance in the price of products to "a general pricing policy of greater volume at prices consistent with reasonable reward for effort and the use of tools."

NON-FERROUS SCRAP

STOCKS of non-ferrous scrap metals at Sept. 30 in Ministry of Supply depots amounted to 48,823 tons, made up as follows:—S.A.A. Cases, 5010 (at July 31—2687); copper and copper alloy, 16,562 (at July 31—16,794); zinc and zinc alloy, 7117 (at July 31—6631); lead and lead alloy, 1156 (at July 31—1158); other grades, 18,978 (at July 31—19,201).

European Recovery

Accent on Fertilisers

A SPOKESMAN of the Economic Commission for Europe said in London last week (when describing the programme of the various committees now seeking solutions to Europe's recovery problems in Geneva) that the work of the Industry and Materials Committee was of especial importance. There are, he said, special sub-committees concerned with particular commodities such as fertilisers, alkalis, timber, etc.

A study is to be made of the capacity of fertiliser and alkali plants in order to recommend the final allocation of 400,000 tons of supplementary coal to be made by the European Coal Organisation for the first quarter of 1948. It is expected that most of this allocation will go to the production of fertilisers based on a survey of excess capacity.

PETROLEUM AND NITROGEN: U.S. SURVEY

U.S. exports of petroleum to Europe and elsewhere can be expected to decline somewhat over the next few years. As it becomes possible for us to do so, we can, if we choose, conserve our own oil resources by importing more petroleum for current consumption. The magnitude of such imports could exceed our present exports to Europe as to make the latter a negligible factor in the long-range conservation picture.

"Unless special measures are taken, American nitrogen capacity will expand only enough to keep pace with domestic requirements."—From the report of the Committee of U.S. Resources to President Truman on October 18.

GELLING OF NITROCELLULOSE—(*Continued*)

number of active groups in the n/cellulose. This is shown by a certain continuity in the curves when passing from an extreme type—with a very good solvent like acetone—to one which, though attaching itself to certain parts of the structure to give an absorption curve, is nevertheless not a solvent at all like the long chain nitrates.

The ketones and esters attach themselves to all the groups, even those in the most crystalline parts, possibly changing even the form of the nucleus or nuclear region. In that event the smallest molecules become attached with the greatest ease, that is to say, under weaker tension and without the aid of a catalyst; while the nitrates probably attach themselves only to active groups or those more accessible in zones of irregular orientation.

The former are not only plasticisers but also solvents (excepting methyl acetate), so that it is possible to obtain a whole series of intermediate states with wide dispersion of chains; whereas the nitrates are not solvents.

Binary Mixtures

Although camphor may be regarded strictly as an intermediate case, it nevertheless belongs to the first category (of solvent-plasticisers) if assisted by a catalyst.

In the case of binary mixtures, such as the experiments in England with alkyl nitrates and alcohol whereby solvent power is considerably increased, these should be regarded as analogous to an ether/alcohol mixture, which is a solvent for dinitrocellulose only and does not produce any change of diagram. Further, there may be only partial solubility through some destruction of the fibres near the surface, but not through penetration into the deeper structure.

Sulphur's Rôle in Oil Refining

Persian Plants Approaching Self-Sufficiency

THE predominance of sulphur in many branches of chemical industry is so familiar that the full story of its ramifications as a key chemical has never fully been told The importance of its rôle in the petroleum refining industry is a case in point Much of the effort in refining petroleum is devoted to eliminating sulphur from petrol and burning oils And the most potent agent for removing sulphur from oil is sulphuric acid

Given those facts, it was inevitable that the close links between oil refining and sulphur production would produce valuable results in the advancement of techniques associated with sulphur chemistry, an outstanding example of which is provided by the Anglo Iranian Oil Company's record in this sphere, the subject of an informative study in the current issue of the company's *Naft Magazine*

First Sulphuric Acid Plant

The story began shortly before World War I when the small quantities of acid employed by the Anglo Iranian Abadan refinery was brought from England

Later, when the refinery had begun to expand and the cracking plants came into commission, the acid had to be used on such a large scale that importation was out of the question and a plant for making it from sulphur was installed in Abadan

This plant, with an output of 30 tons a day, was built in 1930 Since then, to keep pace with the steady expansion of the refinery, five more plants of capacities up to 50 tons a day each have been built, and the figure for sulphuric acid production at Abadan now amounts to over 250 tons a day

The smaller refineries at Alwand and Kermanshah also require sulphuric acid and have small plants for making it There are various other uses for sulphur in Abadan which bring the total amount used up to nearly 2000 tons per month

Crude oil from Masjid i Sulaiman contains in solution large quantities of sulphuretted hydrogen gas Every 25,000 cu ft of H_2S contains a ton of sulphur For many years because there was no satisfactory process available for extracting the H_2S from the crude oil and the sulphur from the H_2S, all the sulphur required in Abadan was imported from Sicily and America

10 Tons Daily

During the 1930's, however, processes for separating H_2S efficiently from other gases were developed and in 1939 a plant for making 10 tons of sulphur daily was built at M I S , this being sufficient to supply Abadan's requirements at the time The separation of H_2S was effected by scrubbing the fields gas with a liquid supplied under the trade name of "Alkacid," which absorbed H_2S very strongly when cold, released it again when warmed, and was then cooled again and returned to the absorbing vessel, thus making a continuous circuit

The sulphur was obtained from the H_2S by a rather elaborate process which in essence was partial burning with a restricted air supply whereby only the hydrogen in the H_2S was oxidised to water while the sulphur was released in the free state

Since the plant was of German design and the "Alkacid" was a secret German product, the company was faced with a major problem to solve when war was declared and supplies were cut off The

(*Continued overleaf*)

The Bibian sulphur plant (left) and the gas absorption plant at Masjid-i-Sulaiman

WIDENING SCOPE OF S.A. INDUSTRIES

NEW foreign markets have been opened up for South African tar and pitch, and the first shipment of 7000 tons was loaded in September at Durban for France, Algeria and Corsica in a French steamer. A number of smaller shipments have been exported since the war to Portuguese East Africa, but export on a large scale to the Continent from the Union has not hitherto been attempted. The tar comes from the South African Iron and Steel Industrial Corporation, Ltd., Iscor, the Government-sponsored steel industry which grew so swiftly during the war that a surplus of by-products has become available for export.

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Morgan Crucible Co. (South Africa) (Pty.), Ltd., 7 Verwey Street, Troyeville, Johannesburg, is a new company which has just commenced the manufacture of carbon brushes and other carbon products, including contacts, carbon gland rings for steam turbines and carbon collectors and inserts, for which there is an increasing demand in many parts of the Union.

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The Lever Brothers' factory in Durban, which now has a large output of vitaminised margarine, has been equipped with the latest machinery, largely of stainless steel. The company utilises the accumulated experience of its associate organisations overseas, where high-grade margarine has been made for many years.

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Paint manufacturers are still experiencing considerable difficulty in securing raw materials. White pigment, one of the main raw materials normally obtained from the U.K. and the U.S.A., is extremely scarce; such quantities as are obtainable are highly priced. Despite the shortage, leading paint manufacturers still refuse to use substitute materials. They would rather lose business than lower the quality of their products, a policy that may well prove to be a wise one.

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In order to keep abreast of new developments in the paint world generally, the local industry has formed a Paint Industries Research Institute, with headquarters at the Natal University College, Pietermaritzburg, Natal. An overseas expert is being engaged to take charge. It is the aim of the paint manufacturers to enable the local industry to produce paint equal in quality with any in the world. Valuable support is being given by the South African Bureau of Standards, which is helping lay down percentages of raw materials to be used in local manufacture. Another matter of concern is the price demanded by Argentine and Uruguayan suppliers for linseed oil, viz., 20s. to 23s. per gallon, as compared with 2s. 4d. to 2s. 6d. per gallon in pre-war days.

SULPHUR IN OIL REFINING—(*Continued*)

situation was made more serious by the fact that "Alkacid" also played an important function in the Abadan hydrogenation plant which at that time was the only plant in Abadan designed to manufacture high octane aviation spirit. It therefore became essential to discover the composition of "Alkacid" and to develop a process for its manufacture without delay. This work was undertaken by Sunbury Research Station in conjunction with I.C.I. and carried out with complete success.

War Developments

Towards the end of 1941 it was decided to erect in Abadan plant for the production of 600,000 tons per year of aviation spirit for the Allied Forces. Later the plant was expanded to make 1,100,000 tons per year.

This great project involved a major increase in the demand for sulphuric acid at Abadan, which in turn meant more shipments of sulphur from the U.S.A. at a critical period for shipping.

The problem was finally resolved by the erection of two sulphur recovery plants, each twice as big as the parent plant, at M.I.S. and Abadan, employing instead of "Alkacid," a solution of potassium triphosphate as a solvent. This reduced requirements of imported sulphur to small proportions.

Transportation of Sulphur in Iran

The greater part of the sulphur made from the oilfield gases is produced at Bibian, a part of the M.I.S. field where such installations as gas recovery plants and topping plants, with their steam boiler batteries and power supplies, have been concentrated.

Production of sulphur raised formidable transport problems in bridging the gap between Bibian and stores area. To improve this section it was decided to build an aerial ropeway which would economise both in distance and in the number of times the sulphur is handled. This ropeway itself represented a major engineering achievement.

The sulphur story—predicts the *Naft Magazine*—is not yet complete. Two new plants designed to recover used sulphuric acid for re-use in the refinery have been erected. The operation of these plants will result in great economy in the use of sulphuric acid and *ipso facto* of sulphur too. Soon sulphur imports into Iran will be a thing of the past.

Official Notices

Trade with Austria

THE Board of Trade announces that, following recent notification of the termination of the state of war with Austria, the following Orders have now been signed:

Trading with the Enemy (Authorisation) (Austria) Order, 1947. (S. R. & O., 1947, No. 2203.)

Trading with the Enemy (Transfer of Negotiable Instruments, etc.) (Austria) Order, 1947. (S. R. & O., 1947, No. 2204.)

Trading with the Enemy (Custodian) (Amendment) (Austria) Order, 1947. (S. R. & O., 1947, No. 2205.)

Full resumption of trade between the United Kingdom and Austria is now, therefore, permitted. It is pointed out, however, that money and property in the United Kingdom belonging to persons resident or carrying on business in Austria and income deriving therefrom, continue to remain under the control of the Board of Trade and Custodian of Enemy Property.

B.I.O.S. BECOMES T.I.D.U.

ALL inquiries regarding German and Japanese reports (which have hitherto been directed to B.I.O.S. at Bryanston Square, W.1), and applications to examine original documents (in the past addressed to Documents Unit, German Division, Board of Trade, Berkeley Square, W.1) are in future to be sent to a newly-formed centralising department—Technical Information and Documents Unit, German Division, Board of Trade, 40 Cadogan Square, London, S.W.1.

Experiments with Ammonium Nitrate

A re-estimation of the relative importance of the three chief chemical fertilisers was suggested in a paper presented by Dr. G. A. Cowie to the Agricultural Group of the Society of Chemical Industry. Experimental data, he said, had shown that nitrogen, such as sulphate of ammonia, was the essential soil requirement in this country and that the selective phosphate and potash fertilisers were needed only where specific deficiencies existed and then were best applied in small quantities with the seed. Response to a second dressing of 1 cwt. of sulphate of ammonia per acre was almost as great as to the first—2.2 cwt. of wheat—and an increased application of 1 cwt. of such nitrogen over present consumption could add 200,000 tons of wheat to our home supply.

Malayan Rubber Revival

Financial Assistance Recommended

IMPORTANT recommendations for increasing the efficiency of the Malayan rubber industry are contained in the first report issued by the Malayan Rubber Advisory Committee. The Malayan rubber industry is in urgent need of modernisation, and the report suggests that this can best be achieved by first providing financial assistance " up to four times the amount which a company is prepared to devote from its own sources for new planting." Such assistance should be the outcome of arrangements between the Malayan Union Government, the new Colonial Development Corporation, and possibly also Malayan banks.

Smallholders, the Committee recommends, should be assisted by the postponement of payment of premiums on new land, an 8-year period after planting being allowed to elapse. Supplies of high-yielding planting material should be made available to smallholders at cost price, and financial help is also suggested for the Malayan Rubber Research Institute.

GAS TO COST MORE

MR. J. R. W. ALEXANDER, general manager of the British Gas Council, estimates that 35 million gas consumers will be affected by an order, which came into force on Monday, of the Ministry of Fuel and Power, authorising gas undertakings to raise their prices to cover recent higher manufacturing costs consequent upon increased coal prices and the termination of Government subsidies on gas oil. Price increases are reported to be ranging from ¾d. to 1½d. per therm.

New Variant for D.D.T.

The production of a close analogue of DDT only slightly toxic to warm blooded animals is the claim made in the U.S.A. on behalf of the pest control research section of the Grasselli Chemicals branch of the E.I. Du Pont Company. The new insecticide, bis(methoxyphenyl)-trichloroethane, is stated to be one-fourth as toxic to men and animals as the more familiar dinitro formulation. The new material, which is as yet being produced only in small quantities, is stated to be more effective than DDT against flies, less lethal to codlin moth, but generally effective in controlling other fruit pests for which DDT is now used.

New Swedish Ores.—Copper-ore deposits with a high metal content have recently been discovered in Norbotten, Sweden. In addition, new iron-ore deposits have been found in the Västerbotten mountain range.

Next Week's Events

MONDAY, NOVEMBER 10

Society of Instrument Technology. College of Technology, Manchester, 7.15 p.m. Mr. S. S. Carlisle: "An Experimental Electrical Pressure Meter for Measurement of Furnace Roof Differential Pressures."

Royal Institute of Chemistry (Hull & District Section). The Royal Station Hotel, Hull, 7 p.m. M. L. Meara: "The Configuration and Polymorphism of Glycerides."

Royal Institute of Chemistry (Leeds Area Section). Chemistry Lecture Theatre, University of Leeds, 6.30 p.m. Annual General Meeting.

Oil & Colour Chemists' Association. Welfare Club, Messrs. British Paints, Portland Road, Newcastle-upon-Tyne, 6.30 p.m. Dr. R. F. Bowles: "A Coaxial Cylinder Viscometer of Wide Utility"; Mr. B. Saunders: "Brushability and the Empirical Flow Tests."

TUESDAY, NOVEMBER 11

The Institution of Chemical Engineers. Burlington House, Piccadilly, W.1, 5.30 p.m. Dr. T. A. Hall and Dr. G. G. Haselden: "The Purification of Gases in Low Temperature Processes"; Dr. M. Ruhemann: "The Ammonia Absorption Machine."

Royal Institute of Chemistry (London & S.E. Counties Section). Royal Clarendon Hotel, Gravesend, 7.30 p.m. Films and Discussion on "Water Treatment."

Society of Chemical Industry (Newcastle-upon-Tyne Section and Society of Glass Technologists). Chemistry Lecture Theatre, Kings College, Newcastle-upon-Tyne, 6.30 p.m. A. E. J. Vickers: "The Use of Photography as a Research Tool."

WEDNESDAY, NOVEMBER 12

Society of Chemical Industry (Food Group). Laboratories of Messrs. J. Lyons & Co. Ltd., Hammersmith Road, W.14, 6 p.m. Conversazione.

Institute of Fuel. Engineers' Club, Manchester 6.30 p.m. Dr. J. H. Bock: "Combustion of Low Grade Fuel with Special Reference to Continental Practice."

Society of Chemical Industry (Plastics Group). Gas Industry House, 1, Grosvenor Place, S.W.1. 2.30 p.m. Mr. S. R. Finn and Mr. L. R. Rogers: "A Method of Following the Phenol-Formaldehyde Reaction."

THURSDAY, NOVEMBER 13

Society of Dyers and Colourists (West Riding Section) Great Northern Victoria Hotel, Bradford, 7.15 p.m. Dr. A. Landolt: "Hydrophobic Melamine Compounds in Textile Processing."

FRIDAY, NOVEMBER 14

Society of Chemical Industry. Imperial Hotel, Birmingham, 6.30 p.m. Sir Hugh Chance: "Chance Memorial Lecture."

Institute of Welding (North London Branch). Manson House, 26, Portland Place, W.1, 7.30 p.m. Professor D. Hanson: "Training for Industry."

International Chemistry Exhibition.—In conjunction with the 21st International Congress of Industrial Chemistry, an international exhibition of pure and applied chemistry will be held at the Université du Travail Paul Pasteur at Charleroi in 1948. Chairman of the general executive committee of the exhibition is M. Albert Debecq, who is general manager of the S.A. de Produits Chimiques d'Auvelais, 3 rue de la Fenderie, Charleroi, Belgium.

Japanese Chemical Recovery

Continued Increase in Most Key Products

THE production of most chemicals continued to increase during April as a result of the improved fuel and power supply position, states Report No. 20 on Non-Military Activities in Japan, issued by General MacArthur's headquarters, a copy of which has just reached this country. The chief exceptions were chemicals dependent on fats and oils, stocks of which are nearly exhausted. Output of sulphuric acid was 124,560 metric tons, just sufficient to meet the present requirements of the fertiliser industry and, to a limited degree, those of other industries. Capacity to meet all needs is said to be available, but maldistribution of pyrites is restricting further output.

Post-War Peak

Increases are reported for the production of sodium products: production of caustic soda by the electrolytic process increased by 23 per cent. Output of calcium cyanamide at 18,923 tons was 43 per cent over the March figure and production of calcium superphosphate reached a new post-war peak of 47,517 metric tons. Ample quantities of Florida rock are said to be arriving.

Among coal-tar products, the total of crude benzene rose from 450 metric tons to 490 metric tons and it is stated that several plants started scrubbing coke gas during April to increase the quantity of crude benzene produced per ton of coal coked.

Output of dyestuffs rose from 149 metric tons in March to 198 tons in the month under review, this increase being chiefly due to a rise in the output of sulphur dyes from 91 to 126 tons.

Chrome, base and acid dye production rose, while production of direct dyes decreased. Production of phenol, aniline, chlorbenzene, nitrotoluene, phthalic anhydride and β-naphthol rose sharply from 73 metric tons to 228 metric tons. Production of acetylene derivatives showed a marked rise because of the improved supply of calcium carbide to the industry. Acetone output rose from 15 to 40 metric tons in April.

Minerals From Morocco. — Enhanced mineral production forms a substantial part of the rehabilitation of the French zone of Morocco, reported on by the Export Promotion Department of the British Consulate at Rabat. Average monthly production of lead is 1800 tons, against 1300 tons in 1946, and a lead smelting works has been established. Other noteworthy increases are iron ore, 30,000 tons exported in April, principally to the U.K., and 35,000 tons in May; cobalt 250 tons a month (140 tons in 1946); and manganese, production being increased from 8000 to 12,000 tons a month.

German Technical Reports

THE release of technical information, collected during the investigation of Germany's industrial processes has provided the following reports :—

BIOS 1459. German radio ceramics (30s.).

BIOS 1487. Chemical laboratory instrumentation in Germany (12s. 6d.).

BIOS 1521. Manufacture of white lead (2s.).

FIAT 817. Vertical mercury chlorine cells I.G. Farbenindustrie, A.G. (6s.).

FIAT 902 The production of crude and purified steroids in Germany (2s.).

FIAT 988. The production of acetylene by the partial combustion of methane (3s.).

FIAT 1051. The manufacture of monochlor acetic acid from trichlorethylene at I.G. Farbenindustrie, A.G., Hoechst am Main, Germany (1s. 6d.).

FIAT 1109. The production of polyvinyl acetals (2s.).

FIAT 1130. The manufacture of sintered magnets in the " Magnetfabrik Dortmund " of the Deutshe Edelstahlwerke A.G. Krefeld (2s. 6d.).

FIAT 1150. Further advances in the German ceramic industry (2s.).

BIOS 1522. Methyl cellulose production at Kalle and Co., Wiesbaden-Biebrich (8s.).

BIOS 1548. The manufacture of azo and lake dyestuffs at Hoechst, Ludwigshafen and Leverkusen (20s.).

BIOS 1554. German malleable iron foundries (with a note on Schenck fatigue machines) (9s.).

BIOS 1567. Manufacture of aluminium clad steel strip by Wickede, Eisen and Stahlwerke (1s. 6d.).

FIAT 656, 658, 659, 660, 662, 663. Rayon processing concerns in Germany (2s. 6d.).

FIAT 843. Chlorinated hydrocarbons from acetylene (6s. 6d.).

FIAT 875. Proposed ethylene oxide manufacture *via* oxidation of ethylene at Zweckel, near Gladbeck (7s. 6d.).

FIAT 892. Ceramic dielectrics for condensers (2s.).

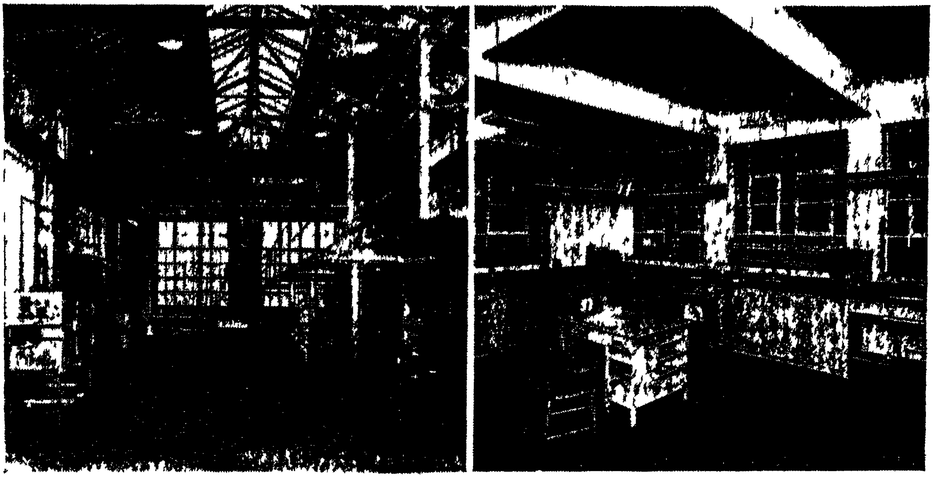
FIAT 998. Fluorobenzene manufacture (1s. 6d.).

FIAT 1001 (and Supplement No. 1). The synthetic stone industry of Germany (3s.).

FIAT 1166. Development of vinyl acetate copolymers at I.G. Farbenindustrie, Hoechst (1s. 6d.).

Private Research Centre for Chemicals and Dyes

Brotherton & Co., Ltd., manufacturers of chemicals and dyestuffs in the North of England since 1878, have opened a centralised research department at Leeds. The formal opening ceremony was performed by Mr. Chas. Brotherton, the chairman, on October 23. It is to serve the company's manufacturing centres at Birmingham, Leeds, Liverpool, Birkenhead, and Wakefield, and will be in the charge of Dr. Cule Davies. The new department comprises three large chemical laboratories, a workshop, a shed for pilot plant, as well as offices and a library.



The pilot plant house (left) and one of the three laboratories

Home News Items

Thirty-first Birthday.—Dunlop Rubber Co. celebrated its 31st birthday at Fort Dunlop on November 1. Its first week's wages bill amounted to £8 14s. 6d.

Chloroform Centenary.—The centenary of the discovery of chloroform anaesthesia by Sir James Young Simpson was celebrated in Edinburgh University on Tuesday. Professor R. J. Kellar presided at a scientific meeting attended by medical practitioners, and papers were read by Professor R. R. Macintosh, Dr. D. S. Middleton and Dr. John Gillies.

Light Industries Preferred.—Increasing shortage of young recruits for some chemical, metal and heavy industries was mentioned as a serious contemporary problem by Mr. L. V. Dunlop of Harland & Wolff, Ltd., speaking in Scotland recently. In the chemical industry, he said, young workers were generally reluctant to sign on where "dirty" or gaseous conditions prevailed and this shortage of workers was likely to increase.

New Light Source.—The research department of Messrs. Siemans electric lamp factory at Preston, has developed a new source of light for use in photography. A development of a wartime invention it is termed the "gas arc," and has the advantage of continuous as well as instantaneous emission. Radiation is produced by conducting electricity through xenon gas at very high current densities.

Chemical Group's War Memorial.—A memorial commemorating the 44 employees of British Glues and Chemicals, Ltd., and associated companies, who gave their lives in the war, was unveiled recently at the company's head office in Welwyn Garden City, Hertfordshire. Relatives and friends of the fallen, who came from many branches of the firm between Newcastle-on-Tyne and Plymouth, attended the ceremony as guests of British Glues, as well as the directors and staff from all the company's establishments.

Aid for Cholera Areas.—At the Liverpool factory of Evans Medical Supplies, Ltd., millions of doses of vaccine has been prepared to combat the epidemics of cholera now raging in Pakistan and Egypt. Every medical centre in Britain is contributing supplies. Employees at medical research centres and distributing chemists have worked overtime and at the week-ends packing supplies, and it is estimated recently that over two and a half tons of vaccines, plasma and other treatments, including new sulphur drugs, had left this country by air.

James Watt Bursaries.—The widow of the late Dr. James Watt has offered the sum of £5000 to the University Court of Edinburgh University. The offer has been accepted, and the income derived therefrom is to provide bursaries for students proceeding to an honours degree in chemistry.

Coal: Best Since May 3.—Collieries and open-cast coal workings produced last week a greater tonnage—4,090,000—than in any week since May 3. This figure contrasts with 3,917,500 tons in the previous week and brings the total for the year to 163,752,200 tons against 158,800,100 tons this time a year ago.

New Factory.—This is an example of the drift north, said Mr. D. L. Hall, general manager of Messrs. Mirrlees (Engineers), Ltd., when he welcomed a number of guests on October 31, to the firm's new factory on the Hillington Industrial Estates, Glasgow, where the firm is concentrating on the production of the rotary positive displacement pump, which had been designed to deal with a wide range of liquids having lubricating qualities. There are orders on hand for more than a year's work.

Dunlop Executive's Tip to Advertisers

"I believe that many advertising managers would find a greater use of the periodical and magazine field to be productive in these days of austerity," Mr. H. W. Eley, Dunlop's general advertising manager, told the Regent Advertising Club, London, last week. "It is needless for men to emphasise the long life of many periodicals and magazines or the loyalty of their readership; but these are factors which the advertising manager, operating in these lean years, should bear well in mind."

Dollars for Patents

Mr. H. A. P. Disney, BETRO director of administration, has written to THE CHEMICAL AGE to say that he is in communication with "a well-known American firm" which is anxious to enter into a "know-how" agreement with a British firm manufacturing coal-tar intermediates, aromatic chemicals, fur dyes, and photographic chemicals. Another American firm is interested in synthetic and natural rubber-based products suitable for cloth-backed fabrics.

PERSONAL

Chemical Society's Secretary

Mr. L. R. Batten has resigned the general secretaryship of The Chemical Society to take up an appointment with Shell Petroleum Co. He will work in the patents section of the company's industrial development management department (The Chemical Age, August 30) as assistant to Mr. A. E. Koeleman. Mr. Batten is succeeded at Chemical Society by Mr. J. Ruck Keene, who was executive assistant in charge of the Society's recent centenary celebrations in London.

Mr. L. R. Batten

Sheffield University Appointments

Recent appointments at Sheffield University include the following: Dr. A. S. C. Lawrence, senior lecturer in physical chemistry; Dr. H. J. Tress, lecturer in glass technology; Mr. Douglas W. Riley, assistant lecturer in chemistry

The following were appointed officers for the 1947-48 Session at the annual general meeting of the Northampton Group of the International Society of Leather Trades Chemists: *President*, D. Woodroffe; *chairman*, P. Stanley Briggs; *vice-chairman*, J. S. Mudd; *treasurer*, F. O. Berrill; *secretary*, F. W. Hancock; *member of committee*, G. H. Tweddell.

Journalist Honoured

Representatives of industry and of journalism from many parts of the country and from overseas were present at a luncheon at Grosvenor House, London, on Monday, given by the directors of Benn Brothers, Ltd., proprietors of The Chemical Age, to Mr. Norman French, managing director and editor of *The Timber Trades Journal*. Mr. E. Glanvill Benn (chairman) presided at the function, which commemorated Mr. French's service with the company extending over nearly 30 years. Major W. Newland Hillas, president of the Timber Trade Federation of the United Kingdom, proposed the health of the guest, and Sir Ernest Benn supported and on behalf of the firm and staff presented to Mr. French a handsome bookcase and a desk.

Prof. J. A. S. Ritson has been elected president of the Institution of Mining Engineers for the year 1948-49 in succession to Prof. Douglas Hay.

I.C.I's. New Research Director

Mr. C. Paine has been appointed research director of I.C.I. Dyestuffs Division, in succession to Mr. J. Baddiley, who retired on September 30. Mr. C. Paine joined Levinstein, Ltd., in 1917, as a laboratory assistant, and graduated with honours in Chemistry, London External, in 1924. He has concentrated on dyestuffs and their intermediates throughout most of his career. In 1935 he was seconded to Professor Traube at Edinburgh University for a few months, and during the following four years, specialised in the handling of technical patents, spending some time in the company's New York office. He was appointed to the board of Imperial Chemical (Pharmaceuticals), Ltd., in 1945. Mr. Baddiley, a pupil of Professor Green's at Leeds University, played an important rôle in putting British dyestuffs on the map. His achievements were recognised by the award of the Perkin Medal by the Society of Dyers and Colourists in 1939.

Mr. J. L. Graham, Dunlop Rubber Co.'s director of overseas sales, has resigned owing to ill-health. Mr. Graham is a director of the Dunlop companies in India, South Africa and New Zealand and of many other associated companies overseas. He will remain available as a consultant. Sir Andrew R. Duncan, Mr. J. H. Lord, and Mr. A. R. Mackay Geddes, have been appointed to the board.

Mr. Samuel Bodlender has been appointed chairman of United Lubricants, Ltd. Mr. Bodlender was formerly secretary of the Standard Life Insurance Company.

Obituary

Lord Forteviot, chairman of the Distillers Company and a director of John Dewar & Sons, Ltd., has died at Dupplin, near Perth. He was 62.

The death occurred on October 30, at Cambuslang, of Mr. Walter John Buchanan, of Buchanan Chemical Company, 18 Watson Street, Glasgow. Mr Buchanan, 46 years of age, had been a partner of the firm since its foundation 24 years ago.

Prof. Dr. Rudolf Neurath, who died on October 15 in New York at the age of 78, was until 1938 Professor of Children's Medicine at the University of Vienna. He was also very active in the field of pharmaceutical chemistry. He was a brother of The Chemical Age contributor—Dr. Frederic Neurath.

Overseas News Items

U.S. to Increase Propane Production.—In view of the importance of propane in the manufacture of chemicals based on petroleum, Philipps Petroleum Co. and the Atlantic Refining Co. are to construct a modern propane plant in Philadelphia.

Better Fuel Supplies in Italy.—Cement industry in Italy has achieved a current output often exceeding 80 per cent of the pre-war production rate, and by the spring of next year all demands that the reconstruction programme may make upon it will be satisfied.

Tin Mine Abandoned.—Mount Bischoff, in Tasmania, formerly the richest tin mine in the world, the re-opening of which during the war has proved uneconomic, is to be sold at auction. Shareholders received £3,000,000 in dividends before mining was abandoned ten years ago.

Less U.S. Coal-Tar. — According to figures published by the U.S. Tariff Commission, output of coal tar totalled 837 million gallons in 1946, a decline of 62 million gallons on 1945. Benzene production fell from 156 million gallons to 135 million gallons and that of naphthalene from 288 million gallons to 242 million gallons.

Italian Metals and Chemicals.—Increases in the output of metal alloys in the first five months of the year have been reported from Italy. Production figures are said to be 21,850 tons compared with 7333 for the same period last year. The chemical industry also reports satisfactory production developments. Against a monthly average of 8770 tons of caustic soda produced during the last quarter of 1946 the July figures for this year were 9257 tons. Electrolytic soda production increased from 1117 tons to 1484 tons while that of chlorine-hydrogen rose from 2698 to 3181 tons.

Austrian Copper Foundry Output.—The Brixlegg copper foundries which were incapacitated by bomb damage have begun work again. Under normal peacetime conditions these foundries supplied not only the biggest part of the country's requirements of electrolytic copper, copper sulphate, and copper for rolling, moulding and forging, but also melted copper scrap brought from South Germany, Czechoslovakia, Hungary and Northern Italy. Production in 1944 amounted to 4600 tons of electrolytic copper and 3000 tons of copper sulphate. At the end of the war stocks were piled high and French occupation authorities were able to seize 18,000 tons of copper and copper sulphate.

No More Oil Concessions.—The Persian Parliament, deciding recently to scrap the oil agreement effected with the Soviet Ambassador in 1946, agreed to forbid the granting of any further foreign oil concessions.

New French Alloy.—According to the U.S. Bureau of Mines, French metallurgists have produced a new aluminium alloy—"Zincral"—containing the following percentages: zinc, 7 to 8.5; magnesium, 1.75 to 3; copper, 1 to 2; chrome, 0.1 to 0.4; manganese, 0.1 to 0.6; iron and silica, 0.7.

Norwegian Steel Plan.—Norway plans to erect a modern rolling mill in North Norway with an initial output of about 200,000 metric tons a year. Domestic steel manufacture at present supplies only a fraction of the country's annual requirements of about 3-400,000 metric tons.

Record Coal Output.—Poland's September coal output of 5,360,000 metric tons represents a new record and exceeds the planned figure by about three per cent. Output for the first nine months of the current year—42,700,000 metric tons—exceeded the plan by about 500,000 metric tons.

More Argentine Petroleum.—Official statistics, show that production of petroleum in Argentina during the first six months of 1947 was as follows: State-owned wells 1,161,183 cu. m.; privately-owned wells 516,892 cu. m. These figures, compared with last year's, indicate that the decline in output, which was attributed mainly to the shortage of oil-drilling machinery, has been checked.

Thos. Ward Expansion.—As part of a programme for expanding its export trade Thos. W. Ward, Ltd., Sheffield, has established a subsidiary undertaking under the designation Thos. W. Ward (Belgium) S.A., with offices at 8 Longue Rue des Claires, Antwerp. The local director in charge of operations is Mr. Jan Bronkhorst, and his field of activity covers the territory of Belgium, Holland and Luxembourg.

Coal Gas Enrichment.—A German process for enriching coal gas to render it suitable as a motor fuel is described in a report by the Office of Technical Services, Department of Commerce, Washington. The process, which involves the catalytic synthesis of methanes from the carbon monoxide and hydrogen constituents of the gas, was developed by the German firm Ruhrchemie A.G., the synthesis reaction being conducted over a nickel catalyst.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

GLYSAN PRODUCTS, LTD., London, E.C., manufacturing chemists, drysalters, etc. (M., 8/11/47.) September 30, debenture, to Martins Bank Ltd., securing all moneys due or to become due to the Bank; general charge. *—. January 1, 1946.

NORTH BRITISH ALUMINIUM CO., LTD., London, E.C. (M., 8/11/47.) October 7, disposition by Royal Bank of Scotland with consent granted in implement of a trust deed dated July 30, 1947; charged on certain property at Inverlochy, Kilmonivaig, and fixtures, etc. *—. March 25, 1947.

Satisfaction

LONDON TESTING LABORATORY, LTD., Monks Risborough. (M.S., 8/11/47.) Satisfaction September 26, £950, registered March 19, 1941.

Company News

Murex, Ltd., announces a net trading profit for the year of £294,313, an increase of £142,725 over the previous year.

The nominal capital of **Vulcan Chemical Co.,** "Braemar," Cleckheaton, has been increased beyond the registered capital of £5000, by £625 in £1 ordinary shares.

The nominal capital of **Ketarome, Ltd.,** manufacturers of aromatic hydrocarbons and compounds, olefins, ketones and petroleum products, 95a Chancery Lane, London, W.C.2, has been increased beyond the registered capital of £500, by £1500, in 6000 shares of 5s.

Erinoid, Ltd., manufacturers of plastics, made a net profit of £67,624 in the year ended July 31, 1947. This compares with £22.257 for the previous year. A dividend of 20 per cent (including 5 per cent bonus) has been paid on the ordinary shares (1946 10 per cent).

Wade Potteries, Ltd., and subsidiary companies report a net profit of £32,688 for the year ended July 31, 1947. Dividends amounting to £8195 are recommended, viz.: £1320 preference dividends, the balance being in respect of 25 per cent payments on the ordinary shares.

New Companies Registered

Norma Chemicals, Ltd. (444,123).—Private company. Capital £1000 in 1000 shares of £1 each. Manufacturers, wholesalers and retailers of fine chemicals and pharmaceutical articles, etc. Subscribers: G. L. Lefson and H. L. Berlak. G. L. Lefson is the first director. Registered office: 112/4 Cannon Street, E.C.4.

Interfusion, Ltd. (444,105).—Private company. Capital £5600 in £1 shares. Manufacturers and dealers in products incorporating plastic or composition substances, including flooring materials, building materials, etc. Directors: I. P. Andren, G. S. F. Barham, G. B. E. Schueler and Mrs. Elizabet M. Schueler. Registered office: 66 Fenchurch Street, E.C.3.

Distillers Company (Biochemicals), Ltd. (443,853).—Private company. Capital £1000 in 100 shares of £1 each. To acquire and operate factories, works and plant for the manufacture of penicillin, streptomycin and other antibiotic compounds, malt, yeast, vitamins and any other pharmaceutical, medicinal and chemical compounds or preparations, etc. Subscribers: E. Barnes and W. Neil Holgate. Registered office: Fleming Road, Speke, nr. Liverpool.

British Petroleum Chemicals, Ltd. (443,602).—Private company. Capital £100 in £1 shares. To manufacture, treat and turn to account chemicals, whether derivatives or compounds of petroleum, natural gas, or shale oil, or of any other nature, etc. Directors: R. Crichton, J. A. Jameson, F. G. C. Morris, N. A. Gass, T. F. A. Board, L. A. Elgood, C. G. C. Hayman and E. Stein. Registered office: 21 St. James' Square, S.W.1.

United Kingdom Chemicals, Ltd. (444,130).—Private company. Capital £250,000 in £1 shares. Manufacturing chemists, manufacturers of chemical and allied products and substances, coke, tar and gas producers, coal and tar distillers, refiners and treaters of coal and other minerals and their derivatives and tar and other products, refiners and treaters of oils, etc. Subscribers: D. G. Bosanquet, and Wm. J. Gurney. Solicitors: Slaughter & May, 18 Austin Friars, E.C.2.

Chemical and Allied Stocks and Shares

CHEERED by the results of the Municipal Elections, stock markets were more active with values in most sections on the up-grade, although best levels were not held, caution prevailing in view of the forthcoming interim Budget. Money-seeking investment went mostly into British Funds, the further gains in which stimulated leading industrial shares. The better tendency in industrials was due in part to wider recognition that even if the Profits Tax were doubled it would in many cases be possible to maintain dividends, although this would necessitate allocations to reserve funds on a smaller scale than in recent years. Moreover, it is being pointed out that should the rise in gilt-edged be on a scale which places 2½ per cent Consols and Treasury Bonds within sight of par, the yield on British Funds would be so small that there would be a strong revival in higher-yielding equity or ordinary shares.

Chemical and kindred shares have reflected the prevailing market tendency, with Imperial Chemical up to 47s. 9d. Greeff-Chemicals Holdings 5s. ordinary were 15s., and B. Laporte 81s. 3d. W. J. Bush were 82s. 6d., and Fisons 64s. 4½d. Glaxo Laboratories have rallied to £18, it being pointed out that the company derives considerable benefit from the end of E.P.T. at the beginning of this year and that this must be reflected in financial results even if the Budget were to double the Profits Tax. In other directions, British Glues & Chemicals 4s. ordinary have been firm at 18s. 9d., and after easing to 27s. the units of the Distillers Co. rallied to 27s. 9d., United Molasses were 47s. 6d., and British Plaster Board 23s. 1½d. Turner & Newall 71s. 6d., Dunlop Rubber 69s. 3d., Courtaulds 43s. 9d., and British Oxygen 93s. 9d. all moved higher, but the best section was provided by iron and steels where sentiment benefited from renewed hopes that nationalisation of the industry may be shelved indefinitely. Dorman Long rose to 27s., Guest Keen to 47s. 7½d., United Steel were good at 26s. 3d., with Stewarts & Lloyds 51s. 9d., Thomas and Baldwins 13s. 3d., Ruston & Hornsby 63s. 3d., Colvilles 27s. 4½d., and Allied Ironfounders 51s. T. W. Ward at 45s. 6d. also reflected the upward movement. In most cases iron and steel shares still offer yields well in excess of the average on industrial securities, and the market view is that there are extremely good prospects of dividends being maintained. Moreover, it is being pointed out that even if nationalisation were forced on the industry, the compensation for shareholders, if fair and equitable, would have to be on a basis justifying higher share prices than those now ruling.

British Aluminium improved to 45s. 9d., General Refractories have been favoured up to 45s. 9d., and Lever & Unilever strengthened to 50s. 9d. Beechams deferred at 21s. 9d. were also better, reflecting hopes that the London Metal Exchange may be reopened next year. Amalgamated Metal shares improved to 17s. 3d., Paint shares also moved with the general trend, International Paint being better at £6¼, with Pinchin Johnson 54s. 6d., and Goodlass Wall 36s. 3d. In other directions, Borax Consolidated deferred displayed firmness at 51s. 9d. Gas stocks and shares were firmer on the suggestion that nationalisation may be postponed, although it is generally feared the Government intends to proceed with its plans. Gas Light & Coke were 20s., and South Met. Gas ordinary stock 39s. Oil shares receded, although pending the financial results, Lobitos improved to 66s. 3d. Shell fluctuated around 77s. 9d. awaiting terms of the expected big £30 million issue which it is rumoured may take the form of one new share at £3 for every three held.

British Chemical Prices

Market Reports

THERE has been no outstanding feature on the industrial chemicals market during the past week and conditions generally remain unchanged with the demand continuing in excess of supply. No important changes in quotations have been reported and the undertone in most sections is very firm. The demand for shipment has been well maintained but actual bookings have been restricted by the prior needs of the home market. This particularly refers to such items as the bichromates, calcium carbide, formaldehyde, soda acetate, citric, formic and oxalic acids. There has been a good call for bleaching powder, sal ammoniac and arsenic, whilst the lead oxides continue in active request. The coal tar products market remains unchanged, with the demand both for home and export account much in excess of offers. Pitch is an active market.

MANCHESTER.—Plenty of business has been on offer on the Manchester chemical market during the week, although in a number of instances there has been evidence of buyers being more anxious to buy than sellers are to sell. This seems to arise partly from the tight supply position and is intensified by prevailing uncertainties. There is a continued steady flow of delivery specifications for textile and other industrial chemicals, and shippers have again been in the market with inquiries covering a fairly wide range. A steady absorption of supplies of most of the light and heavy materials remains a feature of the tar products section.

GLASGOW.—Quiet conditions have prevailed for a week in the Scottish heavy chemical market, although there has been a heavy demand for materials for the paint trade. In the export market, inquiries continue unabated and a few orders have again been booked. There has been a noteworthy demand from overseas for zinc chloride and for one or two other materials for which supplies are available. Import licences in Spain are still difficult to obtain and where shipment is not effected in time it is practically impossible to get a renewal of the import licence.

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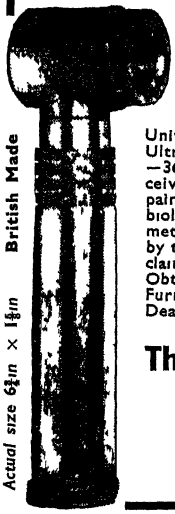

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Sodium Bichromate
Sodium Chlorate
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Sodium Nitrite
Sodium Sulphate desiccated
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LONDON, W.C.2

Branch Office :
51, South King Street,
MANCHESTER 2.

Telephone:
Holborn 2532-3-4-5
Blackfriars 0083/84

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Laminated articles.—N.V. de Bataafsche Petroleum Maatschappij. Feb. 7, 1944. 21742/1947.

Process for the production of convertible alkyd resins.—N.V. de Bataafsche Petroleum Maatschappij. Sept. 14, 1945. 21743/1947.

Compounded lubricating oil.—N.V. de Bataafsche Petroleum Maatschappij. May 1, 1945. 21744/1947.

Hydrogenation of polyallyl alcohol.—N.V. de Bataafsche Petroleum Maatschappij. Sept. 14, 1943. 21745/1944.

Preparation of lead salicylates and mixtures containing the same.—National Lead Co. Oct. 20, 1942. 12837/1944.

Method of preparing pectic substances of high molecular weight.—H. Pallmann, and H. Deuel. Feb. 26, 1946. 4262/1947.

Method of improving the water-solubility of pectic substances.—H. Pallmann, and H. Deuel. Feb. 26, 1946. 4263/1947.

Hydrogen peroxide bleach.—Pennsylvania Salt. Mftg. Co. Sept. 26, 1942. 21486/1947.

Storing and shipping hydrogen peroxide. —Pennsylvania Salt Mftg. Co. March 17, 1943. 21487/1947.

Process of producing magnesium hydroxide and magnesium oxide and products resulting therefrom.—Permanente Metals Corporation. July 18, 1944. 21385/1947.

Process of producing magnesium hydroxide and magnesium oxide and products resulting therefrom.—Permanente Metals Corporation. July 15, 1942. 21386-87/1947.

Anodising aluminium.—Reynolds Metals Co. Feb. 27, 1946. 443/1947.

Process for the manufacture of pentenes. —Roche Products, Ltd. Feb. 27, 1946. 5529/1947.

A process for the manufacture of arabonic acid derivatives.—Roche Products, Ltd. March 30, 1945. 21438/1947.

Imidazolene compounds and process for manufacture of same.—Roche Products, Ltd. July 30, 1945. 21524/1947.

Compositions of matter.—Roche Products Ltd.—Sept. 25, 1945. 21525/1947.

Process for the manufacture of dl —2^1—keto—3, 4—imidazilido tetrahydrofurane—(2)—N—valaric acid and intermediates therefor.—Roche Products, Ltd. July 30, 1945. 21526/1947.

Diazine compounds.—Sharp & Dohme, Inc. Aug. 2, 1939. 21674-75/1947.

Physiologically active substances.—Sharp & Dohme, Inc. Jan. 9, 1940. 21676/1947.

Therapeutically active preparation.—Sharpe & Dohme, Inc. Oct. 18, 1939. 21677/1947.

Barbituric acids.—Sharp & Dohme, Inc. March 23, 1939. 21763/1947.

Fuelling of internal-combustion engines.—Shell Development Co. March 27, 1944. 12459/1945.

Penicillin extraction process.—Shell Development Co. June 19, 1944. 14074-75/1945.

Production of manganous salts.—F. L. Smidth & Co., A/S. Feb. 28, 1946. 5734-35/1947.

Process for the recovery of sulphuric acid from acid sludge.—Standard Oil Development Co. Dec. 28, 1943. 21678-79/1947.

Process for the production of olefins.—Standard Oil Development Co., and Rohm & Haas Co. Nov. 22, 1940. 218/1943.

Refining and decolorising glycerine oils. —Synergic Foundation, Inc. Dec. 8, 1939. 21390/1947.

Process for producing alkylated aromatic hydrocarbons.—Universal Oil Products Co. Feb. 20, 1939. 21346/1947.

Process for the catalytic conversion of hydrocarbon oils.—Universal Oil Products Co. Aug. 14, 1939. 21347/1947.

Process for the dehydrogenation of hydrocarbons.—Universal Oil Products Co. Aug. 12, 1940. 21348/1947.

Process for the production of alkyl aromatic hydrocarbons.—Universal Oil Products Co. March 16, 1942. 21349/1947.

Process for the recovery of hydrocarbons from sludge.—Universal Oil Products Co. March 31, 1943. 21350/1947.

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Harvesting the Sea

THE transition of weed into a useful crop is a fairly familiar form of alchemy and synthetic chemistry has proved more than once its ability to initiate or reverse a process. Seaweed is an example of a weed that has changed its character more than once within living memory. As the principal source of potash and other alkalis it was highly valued in many lands until the Leblanc process drove it from that field. As the reagent in nature's process by which iodine was recovered from seawater it again had a certain value, leading to limited industrial developments, until more profitable chemical processes were found for iodine production.

Under these conditions an entirely fresh outlook was required to inspire the formation some three years ago of the Scottish Seaweed Research Association equipped with a staff of biologists to investigate the growth, yield and conditions of life of the weed, engineers to design methods of harvesting and chemists to analyse it and develop its chemical treatment. Such have been the results of the three years' work that this outcast, termed by Dr. W. A. P. Black in his address to the London Section of the Society of Chemical Industry as "this intriguing weed," may well become the raw material of an organic chemical industry, the potential value of which was assessed by Dr. Black as £15 million a year.

More vegetation grows under the sea than on land. In the sub-littoral area around our coasts between low tide and 10 fathoms depths the growth of seaweed is prolific; around the Orkneys alone there are computed to be 1½ million tons of seaweed. Littoral seaweed is readily cut by hand and a man can harvest 1 cwt. an hour. Sub-littoral weed must be harvested mechanically and as it sinks when cut, the engineering problems of harvesting are considerable.

The extraction processes are not complex. The harvested weed may be extracted with alcohol, and thereby 25 per cent of the whole plant (if harvested in the right months) may be recovered in the form of mannitol, a hexahydrate alcohol of the glycerine group. Containing six .OH groups, it is an excellent starting material for the manufacture of many substances—food products, inks, plastics, medicinal products and explosives among them. Extraction of the weed residue with boiling water then leads to the recovery of laminarin and fucoidin. Laminarin is a glucose polymer, easily hydrolysed, giving a quantitative yield of glucose and therefore an ideal base for foodstuff manufacture; it is used, for example, as a constituent of diabetic flour. Fucoidin, used as a mucilage, is a polysaccharide. Further extraction of the residue with sodium carbonate solution yields a solution of sodium alginate. Alginic acid has a molecular weight of about 200,000 and therefore is an ideal starting point for synthetic fibres, a use to which it was put during the war.

Almost certainly there are many other uses for "this intriguing weed," and much of importance left for Dr. Black and his colleagues to discover. Because we must make the most of all our indigeneous raw materials, ventures such as the Scottish Seaweed Research Association are deserving of all encouragement.

NOTES AND COMMENTS

Soviet Viewpoint

SCIENTIFICALLY, Great Britain is moribund; congresses of scientists run their commonplace course without one cheer from the public at large or a headline in the lay Press, and if any further evidence is needed of the decrepitude of British scientists one need only call to mind " the common dining rooms (in the colleges at Oxford) where professors and students have their meals at plain, heavy tables not covered with anything," or the " strange and comic impression " created by professors attired in their gowns to receive honorary degrees. Rank medievalism! That is not, as might well be assumed, the ill considered account of a child attending a scientific meeting for the first time. It is the presumably studied judgment of Prof. A. Palladin, president of the Ukrainian Academy of Sciences, describing in the Russian *Literary Gazette* the impressions of the Soviet delegation to the International Congress of Physiology, where " quite naturally our papers produced a great impression, for we . . . acquainted our audience with phenomena until then unexplored by scientists." The impression, it seems, would have been more widely received had the delegation not insisted on speaking, in preference to English or French, " the language of the nation which had created the greatest and most advanced form of State in the world.' Other Soviet scientists concurrently attending the International Chemical Congress spoke in English or French. " When they heard of our victory they envied us," complacently records this Soviet scientist. "We must never tolerate any kind of toadying to the West."—The tragedy of this farrago is that it emanates from a presumably accredited scientist.

" Rat Race "

FROM another quarter also comes criticism of an English conference, based, however, on grounds which the Soviet spokesman is unlikely to share. In one respect, and it is a most important one— —says the U.S. *Chemical and Engineering News*—the recent Congress of Pure and Applied Chemistry held in London was a distinct failure. To the best of our knowledge, only three Russian chemists were present, although France, Italy, Holland, and other countries currently beset with currency exchange difficulties had large delegations present. Why were not more Russian chemists in London? Certainly it was not because of any lack of interest on the part of Soviet Russia in chemistry. Would it not have been much more desirable in view of the present international situation to have omitted one or two of the scientific sessions in favour of an open forum on international relationships from the scientists' viewpoint? If scientists are to have a voice in the shaping of world affairs, then they must be articulate. . . . Must we in the future be content to limit ourselves to reading and listening to scientific papers considered by non-scientists as innocuous? If the answer is no to question one and yes to question two, then we are already in another rat race which will only end when World War III has become history, barring some unforeseeable intervention by the hand of God.

I.C.I. Chemicals

IMPERIAL Chemical Industries, Ltd., is not the beginning and the end of British industrial chemistry, as certain propagandists profess to believe. At its post-war stature, I.C.I. is, however, fit to rank with some entire industries as an integer in the sum of the country's industrial capacity. Twelve thousand men and women, 15 factories, close on 250 products —there are the bare bones of the General Chemicals Division, notes the current issue of the " I.C.I. Magazine " in an illustrated review of the Division; and this, of course, pays no regard to the great ancillary industries which go to make up I.C.I. If it did the magazine might have been mistaken for a Blue Book rather than the lively and well presented piece of literature that it is. The chemical group itself shares the characteristic of a mountain range, the tantalising refusal to show all its members at the same time, and the current survey has the merits of an ordnance map—worth studying because of its intimate bearing on current production problems. Two things emerge very clearly from the I.C.I. article : the war has given a great impetus to the driving force animating this chemical empire, as well as adding substantially to its plants; and the vitality of its research departments in

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fundamental and applied chemistry can hardly fail to initiate in years to come developments as phenomenal as the past two decades have witnessed. One thing alone could reduce it to impotence. The history of the coal mining industry since 1916 seems now to have rendered that danger more remote.

Incentives

A NEW kind of exhibition has been staged at Cefn Mawr by Monsanto Chemicals, Ltd. The firm, which has transformed the industrial complexion of the district, has set out to show the people of the neighbourhood how the chemicals produced by local workers are essential to the prosperity of the country. Employed there are some 1400 men, as many as were previously occupied in coal mines, which are now closed. An export chart showed that 80 per cent of the products are exported and that if a certain product exported to America last year had been paid for in wheat, it would have provided for one year the bread ration of the population of Wrexham and East Denbighshire. The exhibition was opened on November 5 by Mr. H. T. Edwards, Shotton, who said he was proud of the relationship that existed between the firm and the trade unions. "I have never yet failed to find them receptive to new ideas," he said. "We are worried to-day about incentives. I hope this excellent feeling will carry us through the crisis." The problem, said Mr. Edwards, was a common one for the management and the men. The firm had already exceeded its export target, which had helped materially to earn dollars. Mr. E. A. O'Neal, managing director, and Mr. N. F. Patterson, works manager, both acknowledged the collaboration of the trade union representatives and the workers, and expressed the hope that they would all go forward together with energy and vigour to increase production and make their contribution to the prosperity of the country. That, we suggest, is typical of leadership and integration in the production field, in which the record of larger-scale chemical undertakings is in marked contrast to the troubled affairs of some other key industries.

DRIED EGG TESTING

SUCCESSFUL instrumental testing of bulk dried egg deliveries during the war years was described by Mr. F. W. F. Hansen, of the Torry Research Station, Aberdeen, and formerly with the Government Chemistry Department in Liverpool, when he spoke to the Aberdeen Business and Professional Club last week. When first deliveries were received, analysts had to start from scratch to devise testing methods. Research men discovered that a grain moisture heater could be used with success on dried egg. Old meat boxes were utilised in the construction of apparatus needed for fluorescence testing as a guide to solubility, and it was finally possible to eliminate testing altogether and to sample up to 2000 tests per day, thus enabling the Ministry of Food to sort out and allocate dried egg according to requirements.

Record Oil Output.—Anglo-Iranian Oil Company's output for August amounted to 2,056,000 tons (a new record) which compares with 1,910,000 tons in July, and 1,821,000 tons in June.

Exchange of Students

Ten Continental Countries Participating

THE international exchange of technical students initiated in 1946 by the Imperial College, London, under its vacation work scheme in collaboration with the British Council and certain Continental and Scandinavian universities and technical colleges will hold a conference of the organisers at the Imperial College from January 5-9, 1948.

This exchange provides students with eight weeks' practical experience during the summer vacations under industrial conditions in a foreign country, with opportunities of living as well as working with the peoples of other nations.

Co-operation from Industry

The objects of the forthcoming conference are: (a) To review the exchanges made in 1947 when 220 students took part between Great Britain and Continental and Scandinavian countries. (A number of exchanges were also arranged between the other countries.) (b) To formulate the standards of knowledge, training and experience which are desirable for students taking part. (c) To obtain the co-operation of industry, in the countries concerned, for the provision of practical experience with sufficient emoluments to enable students to meet their cost of living expenses. (d) To arrange exchanges for 1948.

The observations of and on the students taking part in the exchange in 1947 are very encouraging, states the Imperial College, and it is to be hoped that industrial organisations will appreciate the mutual advantages to be gained by a further development of this exchange and come forward with their helpful co-operation for the summer of 1948.

Representatives of the undernamed countries have accepted preliminary invitations to attend: Belgium (Brussels University or Comite Interuniversitaire pour l'organisation des stages Industrials); Czechoslovakia (University of Prague); Denmark (Technical High School, Copenhagen); Finland (Technical High School, Helsinki); France —Ministry of Education (Direction de l'Enseignement Technique); Great Britain (Imperial College); Holland (Technical High School, Delft); Norway (Technical High School, Trondheim); Sweden (Svenska Industriens Praktiknamed; Technical High School, Stockholm; Chalmers Institute, Goteberg); Switzerland (E.T.H., Zurich).

Franco-Swedish Trade.—A recently signed trade agreement between France and Sweden provides *inter alia* for the shipment of crude phosphates and soda products from France, against iron and steel manufactures and paper pulp.

Dutch Trading Group

Export-Import Office Established

FURTHER news of the recently established Dutch Sales Office for Chemicals (Nederlands Verkoopskantoor voor Chemische Producten) indicates that its members are: State Mines, Sulphuric Acid Co., Ketjen, Dutch Salt Industry, Mekog, and the Mining Co., Aime. The organisation has been formed for the purpose of greater economy in the disposal of Dutch chemicals abroad as well as facilitating imports of chemicals not at present manufactured by the firms named. A centralised sales policy will also apply for the Dutch market. Omitted from the scheme are fertilisers and ammonia (State Mines), salt (Salt Industry) and fertilisers (Mekog).

Shares of the Zwanenberg-Organon Co., in whose laboratories there have recently been important developments in the production of vitamin A, are being offered on the Amsterdam Stock Exchange in order to obtain additional capital to enable the company to carry through its expansion programme and to pay off bank credits. This company also produces hormones, liver and vitamin specialties, and was the first industrial producer of insulin on the Continent. Its new factory for DDT and DDT products at Boxtel will soon be ready.

Dutch Source of Cheaper Plastics ?

A new group of raw materials, so far not described in scientific literature, which are claimed to make cheaper the manufacture of plastics, has been found by the laboratories of applied natural science at Delft, Holland, according to the American *Product Engineering*. The new product resembles methacrylate, according to Dr. L. C. Stoutjesdyk, manager of the Plastics Institute of Delft, the magazine reports, and it is claimed it will be possible to produce plastics with highly divergent properties. For instance, the surface hardness can be varied. Dr. Stoutjesdyk stated that existing Dutch industries would find no difficulty in switching to the production of these compounds.

Canada Needs Scientists.—Shortage of scientists is "seriously affecting" Canada's research programme, including atomic development at the Chalk River, Ontario, project. This is indicated by Mr. F. H. Sanders, technical assistant to president C. J. Mackenzie of the National Research Council, who says: "that even the added glamour of working on the Chalk River atomic pile has not been enough to enable us to fill our establishment." At the Research Council itself important projects were being held up for lack of trained personnel.

CHEMICAL INDUSTRY IN AUTUMN

Continued Rise in Employment Totals

EVIDENCE that the tide of employment in chemical industry continues to rise, latterly at a somewhat accelerated rate, is one of the significant facts contained in the October issue of the Central Statistical Office's *Monthly Digest of Statistics* (H.M.S.O., 2s. 6d. net).

Although the figures in this and several other sections of the review take account only of changes up to August last, since when it is reasonable to expect even larger accretions to the labour force have taken place, an overall increase of 2000 is reflected in the August total of 354,000 workers making chemicals, explosives, paints, oils, etc. This is by far the largest increase since the April recovery from a marked reduction in the previous month and is, of course, the highest level reached since the end of war production in 1945.

Although the number of women in the chemical industry (181,100) contributed a further 300 to the general recruitment, the preponderance of male workers (235,900) was more marked than hitherto. Of all workers, 288,400 were employed on home and supply department manufactures and 65,600 (against 64,000 in July) for the export market.

Among the more noteworthy changes in production totals, summarised in the table below, was the improvement in September in the fluctuating totals of sulphuric acid to 107,600 tons (compared with 103,600 tons in August). This figure is, however, still substantially lower than the average monthly production since the beginning of the year. This is associated with the sharp seasonal reduction in consumption between July and August—from 113,000 to 102,000 tons. Stocks of acid reached the unusually low level of 56,000 tons in September, pyrites was also scarcer, but spent oxide stocks (81,200 tons) were heavier than in any month since the war.

No very wide fluctuation is observable in the figures for fertilisers, production and stocks as a whole remaining steady, although production of superphosphate and compound fertilisers is still well below the level of recent years.

Shale Mining Prospects

Improved Conditions and Output

THE recent introduction of better wage scales in the Scottish shale mining industry, and the granting of better working conditions and paid holidays have had the effect of increasing production. Output is now 8 to 10 per cent higher than it was before the holidays and workers' tendency to drift away from the industry is believed to have ceased, not so much because of the Control of Engagement Order as from a general appreciation of conditions. The industry is hoping for an exemption order to prevent the call-up of its young miners, who it feels should be exempted on the same grounds as coal miners. A standstill order has just been issued, and a final decision is expected soon.

The first party of European volunteer workers to start work in Scottish shale mines is now staying at a hostel at Armadale. Numbering 43, they are mainly Latvians and Estonians from the displaced persons' camp at Lubeck, in Germany. Poles are also to be employed in the shale mines and a party of 23 will shortly arrive at the Forth Hostel, Lanark.

CHEMICAL PRODUCTION AND USES—AUGUST AND SEPTEMBER

	July, 1947 Thousand tons			July, 1946 Thousand tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	107.6	102*	56	106	110	57.2
Sulphur	—	17.6	81.2	—	16.8	90.5
Pyrites	—	14.9	71	—	15.3	71
Spent oxide	—	14.8	155.2	—	14.7	138.1
Molasses†	6.9	30.8*	187.2	5	34.5*	136.6
Industrial alcohol (million bulk galls.)	2.07	2.15	5.48	2.20	34.5	1.33
Superphosphate†	63.7	66	106.1	74.7	80.5	114.2
Compound fertilisers†	105	68.5	141.5	102.8	76.6	237.2
Agricultural lime	—	223.9	—	—	259	—
Ammonia	—	5.92	3.52†	—	6.02	4.32
Phosphate rock (agricultural)† ...	—	54.5	136.2	—	59.3	119.7
Phosphate rock (industrial) ...	—	58.7	35.8	—	4.29	38.8
Virgin aluminium†	2.21	12.2	—	2.25	12.1	—
Magnesium†	0.12	0.24	—	0.09	0.20	—
Virgin copper†	—	26.7	102.3	—	25	85.1
Virgin zinc†	—	16.7	34.4	—	16.7	61.3
Refined lead†	—	16.9	42.2	—	16.1	27.1
Tin†	—	1.89	17	—	2.13	22.1
Zinc concentrates†	—	13.5	64	—	11.6	118

* Distilling only † August

India's Chemical Blue-Print

INDIA can become self-sufficient in regard to fine chemicals, drugs and pharmaceuticals within a period of 15 years, according to the report submitted by the panel on the industry set up by the Government of India under the chairmanship of Col. R. N. Chopra.

The panel feels that the proper development of the fine chemicals and drugs leading to self-sufficiency ultimately would depend very much on working out a well-balanced and integrated plan for the production of heavy chemicals, coal distillation products, organic solvents, etc. Further, as the production of these materials is also necessary for the production of dye-stuffs, artificial fibre, plastic, synthetic rubber, etc., a workable programme can be drawn up, only by integrating the reports of the panels on these different industries.

Among the heavy chemicals, the manufacture of three items, *i.e.*, chloro-sulphonic acid, sodium and chlorides of phosphorus, is very important and may be taken up without delay and the production of intermediates from coal distillation products, such as aniline, acetanilide, chloro-benzene, phenol-diethylaniline para-anisidine, paranitrotoluene, phthalic acid and anhydride, etc., deserves prompt attention. Also, special efforts should be made to produce refined pyridine, which is essential for the manufacture of sulpha drugs.

Among solvents, India produces ethyl-alcohol in good quantities at competitive prices. Acetone is being produced at one of the ordnance factories. If the production of acetone in the factory, where it is not required for making explosives, is kept up, the needs of the drug industry will be met to a great extent. Immediate arrangements should, meanwhile, be made for the manufacture of other solvents such as acetic acid, butyl and amyl alcohols and also of ethylene oxide, which is a valuable intermediate.

Production of Essential Drugs

Steps should also be taken for the manufacture of requisite quantities of lactose, thiourea and guanidine nitrate, the first of which is required for the manufacture of penicillin and the second and third for the manufacture of sulpha drugs.

The production of essential drugs, says the report, should not wait on the production of basic chemicals in the country. The country should, on the other hand, immediately start with the manufacture, utilising the raw materials already available and importing those not available until national resources are developed.

The panel recommend that the production of two types of drugs should be taken in hand immediately, viz., (1) those which are essential for guarding the health of the public and warding off infectious diseases, (2) those for which India already has or can easily develop raw materials in abundance. Under the first category come the sulpha drugs, anti-malaria drugs (quinine, mepacrine, pamaguine, paludrine), penicillin and streptomycin. The arsenicals and DDT can also be included in this list. In the second group come the drugs of vegetable origin. Products such as quinine, emetin, morphine, caffeine, ephedrine, santonin and essential oils, etc., should be developed to the fullest possible extent, both for the needs of the country and for export. In this group, the biologicals, vaccines and sera, liver extracts, glandular products, etc., may be included. Production of insulin on a commercial scale should also be taken up.

Prospects for Shark Oil

Pointing out the scope which exists for the expansion of the shark liver oil industry, the report recommends that a Central Board, representing the relevant departments of the Government of India, the Departments of Fisheries of the different maritime Provinces and non-official experts, with a whole time executive, should be formed to work out the necessary steps to put the shark liver oil industry on a firm and permanent basis.

Discussing the general policy of the State in regard to the fine chemical industry, the panel suggest that in the manufacture of new and vitally important drugs like penicillin, streptomycin, mepacrine, sulpha drugs, etc., the State should take up the initiative at least in setting up model plants and training personnel. They plead for remission on customs duty for the first five years on raw materials and semi-manufactured goods required for the industry and for making excise policy throughout India uniform. They also urge the revision of railway freight rates.

The report contains appendices written by experts on a number of special problems related to the industry, like machinery, equipment, manufacture of penicillin and of sulpha drugs, shark liver oil, etc.

Effect of Wagon Shortage

Steel production in the Tees area was reported last week to have been hampered by non-clearance of stocks consequent upon a serious rail transport shortage. At the Cleveland Iron & Steel Works where normally not more than 20,000 tons should have accumulated, there were 33,000 tons representing a week's output. One estimate puts the wagon shortage at 1000 a week. Incoming raw materials may soon be affected.

A STANDARDISED pH SCALE

U.S. Standard Bureau's Bid for Uniformity

BECAUSE there is an increasing need in science and industry for accurate determinations of acidity, the U.S. National Bureau of Standards has announced its advocacy of the universal adoption of a single standard *p*H scale, similar to the International Temperature Scale, in place of the several *p*H scales, based upon various definitions, now used by chemists. It is proposed that the *p*H assigned to solutions of buffer substances distributed by the Bureau as standard samples should be taken as the fixed points on this standard scale.

In the preparation of many commercial products, such as paper, textiles, dyes, ceramics, and beer, the rapidity and efficiency of the processes depend upon accurate control of the acidity or alkalinity of aqueous solutions. Such control is now a regulatory requirement in the preparation of certain medicines and in the manufacture of paper and leather for the U.S. Government. Another application of particular importance is the avoidance of corrosion and embrittlement of boiler walls and tubes by regulation of the acidity of boiler water. The wide spread losses due to underground corrosion are likewise effectively curbed in many cases by proper adjustment of acidity.

The several convenient *p*H meters now available commercially enable precise determination of *p*H values in such varied media to be made with ease and rapidity, but these values are based upon a scale fixed by the *p*H assigned to the standards with which the instrument has been calibrated.

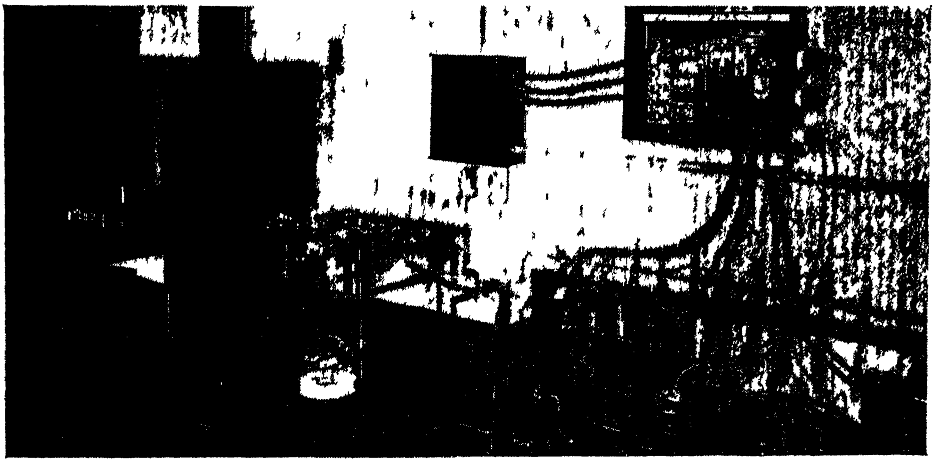
The differences among scales of *p*H are the direct result of different procedures, different definitions and different assumptions employed in arriving at the *p*H of the standard. The *p*H may be defined in one instance as the negative logarithm of the hydrogen-ion concentration or, again, of the effective concentration or "activity" of this ion. Often the *p*H value as defined by Sorenson in terms of the electromotive force of a galvanic cell with hydrogen and calomel electrodes is chosen. Although the differences among these scales rarely exceed 0.1 unit, the need for greater accuracy makes desirable the general adoption of a single series of consistent *p*H standards.

Uniform Samples

In an effort to encourage standard procedure in *p*H measurements, the National Bureau of Standards is now supplying four buffer materials in the form of samples of certified purity. These substances are acid potassium phthalate, potassium dihydrogen phosphate and disedium hydrogen phosphate (intended to be used together), and borax. They are being distributed at the rate of several hundred samples annually. The certificates furnished with these compounds specify the *p*H of certain aqueous solutions of the sample, which can provide fixed points on a *p*H scale.

In order to assign exact values to these fixed points, it was necessary to set up a scale based upon some suitable definition of

(*Continued on page* 646)



Bureau of Standards equipment for ascertaining E./M. force data and assigning pH values to solutions of standard buffer materials: in the foreground are the test solutions in glass cells and left is a potentiometer

Research Company's Plan

Financial and Material Aid for Inventors

AMALGAMATED Research and Development Company is the name of an organisation recently formed to promote co-operation between industry and inventors. Its purpose is to develop new ideas and processes with a view to reaching production stages more rapidly than is usually the case when inventors work independently Inventors are to be encouraged to bring their ideas to A.R.D.C. whose experts will examine them with a view to their exploitation.

The company states that its services are three fold, viz. :—financial assistance; provision of facilities for development (laboratories, equipment, materials, etc.); and marketing. "It is proposed," said the commercial manager (Mr. A. M. T. Tucker) to THE CHEMICAL AGE last week, "to draw up agreements with inventors as soon as it seems to us that their ideas have a commercial future. A number of agreements are already in existence. Sometimes we hear from people who are interested only in finance, but more frequently it is facilities for research that they lack. One man who came to us recently with a new decorative and protective finish for light alloys involving the use of cellulose acetate, preferred to use his own laboratory. We have therefore made a temporary arrangement whereby we employ him at a salary and at the same time pay him a rent for the use of his laboratory."

Wartime Research

Sponsors of the project are Associated British Engineering, Ltd., Dawnay Day & Co., Industrial Bankers, Ltd., and General Mining Industries, Ltd., of South Africa, and its directors Messrs. R. P. Fraser, A. C. Geddes, C. L. Hill, and J. M. Hopkinson. The project is understood to have been conceived by Mr. Fraser, a chemical engineering consultant, who has specialised in combustion technology, and during the war did valuable work in the design and production of flame-throwing apparatus. He is still chairman of a special committee of the Ministry of Supply which is concerned with chemical warfare.

In the company's view, inventors' facilities in the past, have been too few and not generally known or readily accessible to individuals. Too many sound innovations have been pigeon-holed or rejected by their originators owing to lack of suitable expert counsel. This is a defect which A.R.D.C. hopes to remedy. Already considerable progress has been made in the fields of chemicals and chemical engineering, the latter department being located at Causeway Works, Staines, Middlesex. A.R.D.C.'s H.Q. being at 32 Duke Street, St. James', S.W.1.

Official Notices

Industrial Sugar Cut.—The reduction by 25 per cent of the total allocations of sugar for manufacturing purposes, which is one of the Government's measures to save dollar expenditure on food, will take effect from January 4, 1948.

Aluminium Increase.—The Ministry of Supply announces that the price of aluminium in notch bar form has been increased from £80 to £82 10s. per long ton delivered to consumers' works.

Exports of Soap.—The Ministry of Food will allocate additional oils and fats for the manufacture of soap for export to the following markets :—Australia, Formosa, Iran, Liberia, Newfoundland, New Zealand, North, Central and South America, but excluding the European Colonies, Philippine Islands, Portugal and its Colonies, South Africa, Sweden, Switzerland, and U.S.S.R.

Applications for export licences should be made to the Secretary, The Soap Trade Export Group, Wood Street, Bebington, Cheshire. Licences will be valid for three months.

Prices of Oils and Fats.—There will be no change in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four-week period ending November 29.

The Ministry of Food announces that no changes will be made in the prices of refined oils and imported edible animal fats in wholesaler quantities during the eight-week period ending January 3.

STANDARDISED pH SCALE—*Continued from page 645*

pH. A consideration of the advantages and limitations of several scales led to a choice of a modified activity scale as most convenient and practical for general use. Although the activity of a single ionic species can be simply defined only in very dilute solutions, the influence of the hydrogen-ion activity in chemical equilibria is of far-reaching importance.

The *p*H of the Bureau standards is derived from measurement of the electromotive force of cells without liquid junction, in which they are used as electrolytes. These cells are specially designed, utilising the highly reproducible hydrogen and silver-silver chloride electrodes. Computation of *p*H is based upon several reasonable assumed relationships between ionic activities and mean activities. These assumptions are found to give identical values for dilute solutions. The scale thus obtained approaches a true scale of activity for solutions of low concentration; at higher ionic strengths it is best regarded as a consistent scale which necessarily rests upon an assumption not subject to experimental proof.

Model Safety Rules

Revised Version Ready for Publication

THE Association of British Chemical Manufacturers has announced that Part I of the Model Safety Rules for Use in Chemical Works, the revision of which has been in the hands of a representative body of experts for some time, is now ready for publication and will shortly be generally released.

Making the announcement, the association recalls that Part I of the Model Rules was first issued in provisional form in 1929. The second edition was issued in April, 1938, to take account of the Factories Act, 1937. Since 1938 there have been far-reaching advances in chemical technology.

Joint Responsibilities

The council of the association regards it as essential that safe working conditions shall keep pace with technical improvements in order that the industry shall offer attractive and congenial employment. The whole problem was accordingly considered by a joint committee of the Association of British Chemical Manufacturers and the Association of Chemical and Allied Employers.

It was agreed that the A.B.C.M. should resume and extend its pre-war activities in the field of safety in its technical aspects, and that A.C. & A.E. should deal with personnel and welfare matters, each association giving full support and assistance to the other.

The council accordingly appointed in 1946 a new Works Safety Committee to carry out an extensive programme of safety work. The revision of Part I of the Safety Rules for use in Chemical Works was undertaken as a matter of the first importance. The rules have been revised and extended to incorporate the various changes in legislation and experience gained in their use. They have been perused by the Chief Inspector of Factories, who commends them as worthy of the most careful consideration by all concerned.

Part I has been revised under the general supervision of the Works Safety Committee of the association by the following panel of the Works Safety Committee: Chairman, Dr. W. E. de B. Diamond (British Plastics Federation), Mr. S. E. Chaloner (Monsanto Chemicals, Ltd.), Mr. W. H. Harris (Boots Pure Drug Co., Ltd.), and Mr. G. G. Sutherland (Imperial Chemical Industries, Ltd.).

Copies of Part I will be vailable to non-members of the association at 7s. 6d. per copy, post free. Orders should be addressed to the association at 166 Piccadilly, London, W.1.

PARLIAMENTARY TOPICS

D.S.I.R. "Ceiling."—Asked by Mr. I. Mikardo to define the financial and establishment ceilings imposed by the Treasury on the Department of Scientific and Industrial Research, Mr. Herbert Morrison (Lord President of the Council) said no financial ceiling had been imposed on the D.S.I.R. A staff ceiling had been prescribed which permitted an increase of the non-industrial staff of the Department by approximately 25 per cent above the total of such staff employed on January 1, 1947. In fixing this ceiling as a limit within which the Department should be authorised to work until further notice, the Government gave full weight to the importance of the development of scientific research for the benefit of industry and the community in general and for assisting in the moulding of administrative policy, bearing in mind also the acute shortage of scientific man-power and the necessity for avoidance of measures which might result in disproportionate use of such man-power in industry. Government and the universities.

Carbon black, the shortage of which earlier in the year had restricted tyre production, was in much better supply in September when consumption of rubber was the highest recorded. Although carbon black stocks had been increasing, estimated deliveries for the immediate future were not so good as in recent months.—Mr. Belcher (Parliamentary Secretary to the Board of Trade).

Soda ash, for which there are essential prior industrial demands, is being allocated to manufacturers in accordance with 1946 levels. The soda ash industry is working to full capacity, and distribution is being carried out as effectively as possible.—Mr. Belcher.

Plantation rubber is a commodity which the Government "has well in mind" as an earner of dollars. As to whether it would be possible to invite the U.S. Government to increase its purchases of rubber to offset supplies of tobacco and lard from the U.S.A., no further statement can be made at the moment.—Mr. Belcher.

IRON COMPOUNDS AND PHOSPHATIC FERTILISERS

THEIR EFFECTS IN PRODUCTION AND USE

by H. W. Lehnecke, Ph.D.

THE compounds of iron with phosphoric acid play an important rôle in the chemistry of phosphoric acid fertilisers. Their presence in these fertilisers, especially in superphosphate, is the primary cause of the fact that part of the P_2O_5 present is not water-soluble, but only soluble in an ammoniacal solution of citrate of ammonia (so called Petermann-solution). These "citrate-soluble" compounds are, it is true, available for the roots of the plants as long as they are freshly formed, but the "citrate-solubility" diminishes during storage and under the influence of elevated temperature.

The water-soluble compounds of phosphoric acid which are introduced into the soil in the form of powdered or small-grained phosphoric acid fertilisers, combine rapidly—especially in acid soils—with the ions of trivalent iron (and aluminium) present in the soil, forming combinations which are insoluble in water but citrate-soluble. These compounds also lose their citrate-solubility after some time, especially under the influence of drought and elevated temperature (radiation of the sun on the soil-surface).

Granulated Fertiliser

In spite of this rapid transformation in the soil of the water-soluble phosphoric acid from ordinary phosphatic fertilisers into compounds which are insoluble in water but citrate-soluble, the most important of these fertilisers, *i.e.*, superphosphate, is, in many countries, regularly sold according to its content of water-soluble phosphoric acid, nothing being paid for that part of the phosphoric acid which is only citrate-soluble. As long as superphosphate is produced in the ordinary powder-form, this evaluation lacks any theoretical justification. The situation, however, will change fundamentally if the use of granulated superphosphate increases.

This form of superphosphate offers the important advantages that the granules can be placed at the most favourable depth and situation in relation to the roots of the plants, and that a zone around the granules is formed in the soil in which the water-soluble phosphoric acid emanating from the interior of the grains can no longer be transformed into compounds insoluble in water, all ions of iron (and aluminium) being fixed before by the phosphoric acid primarily diffusing from the surface of the grains. In this way the roots of the plants meet a zone of easily available water-soluble phosphoric acid around the granules of superphosphate.

Evidently the consequence of an increased use of granulated superphosphate will be a strengthened demand for water-solubility of its P_2O_5-content. Therefore, it is possible that those countries where the content of "available" phosphoric acid in phosphatic fertilisers is determined as water- and citrate-soluble P_2O_5, will return to the standard of water-solubility exclusively. The consequence will be that the manufacturer of superphosphate must make greater efforts to avoid the formation of only citrate-soluble compounds of phosphoric acid. As already emphasised, the formation of phosphates of iron plays the most important part in this connection.

From the foregoing it is evident that the chemistry of these compounds deserves increasing attention from the manufacturer as well as from the agricultural chemist.

Two Forms

It is natural that in this connection the compounds of trivalent iron with phosphoric acid are of greater importance than those of iron in the divalent form. Oxygen from the air is present during the manufacture and storage of superphosphates as well as near the surface of the soil where the fertiliser is applied, so that the transformation of divalent iron into the trivalent form readily occurs.

A certain part of the content of iron in superphosphates, it is true, remains in the divalent form during storage, the access of oxygen from the air being impeded by the compact structure of the heap. This form of iron phosphate, however, has no influence as such on the evaluation and the fertilising effect of the product, as the divalent form of iron rapidly turns into the trivalent on coming into contact with the soil solution.

The same is manifest when analysing the soluble phosphoric acid in superphosphates: the divalent iron rapidly changes into the trivalent form during the extraction of the sample with water or with a solution of ammonium citrate[1]. Thus, the only compounds of iron with phosphoric acid we have to deal with in practice are those of trivalent iron. The following work concerns these compounds only.

Ferric phosphate, $FePO_4 2H_2O$, as will be shown, can be obtained in two different forms, a colloidal or amorphous one and a crystalline one. The colloidal variety is formed in very dilute solutions containing ions of Fe . . . and PO_4 ′′′, when the *p*H of the solution mounts to 2 or higher.[2]

The total analysis and the isoelectric point of the colloid changes by adsorption and hydrolysis.[3] When precipitating it from dilute solutions, the molecular ratio between PO_4 and Fe attains the full theoretical value for $FePO_4$ only if a considerable excess of PO_4 ions is present. The composition depends upon the *p*H during precipitation, the ratio between PO_4 ′′′ and Fe . . . in the solution and, to some extent, upon the degree of dilution. Increasing the *p*H of the solution results in precipitates with a lower proportion between PO_4 and Fe than one.[2] This is the result of an increasing hydrolysis, whereby PO_4 passes into the solution, and a corresponding quantity of Fe remains in the precipitate as $Fe(OH)_3$. When the *p*H attains a value of 7.1 this hydrolysis becomes complete.

Amorphous Ferric Phosphate

Amorphous ferric phosphate can be obtained in the form of a yellowish precipitate by reaction between a solution of an iron salt, *e.g.*, iron chloride or sulphate, and a solution of a secondary phosphate, *e.g.*, disodium or diammonium phosphate. Using relatively concentrated solutions, containing *e.g.*, one mole. of salt per litre, ferric phosphate with the theoretical composition is precipitated from equivalent quantities of the solutions at a *p*H between 2 and 6. Using solutions of iron salts with lower concentration, such as normal solutions, an excess of approximately twice the theoretical quantity of PO_4 ′′′ ions is necessary in order to obtain the theoretical composition of $FePO_4$ in the precipitate. Without this excess its content of PO_4 will be too low.[1]

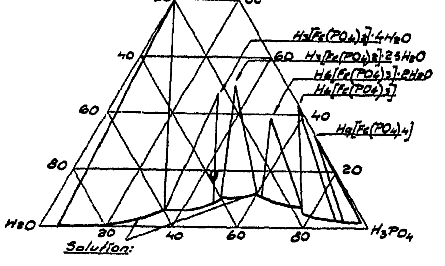


Fig. 1. The system $FePO_4$ — H_3PO_4 — H_2O at 40°C.

The amorphous ferric phosphate obtained in this way always contains a considerable quantity of colloid-bound water which is difficult to remove by drying without altering the colloidal state.

The colloidal modification of ferric phosphate is labile and turns into a crystalline form under the influence of heat. This property of ferric phosphate of forming an amorphous modification is unique among all compounds of trivalent iron with phosphoric acid and of great importance with respect to the question of solubility (see later) and availability for the plants. All other stoichiometrical combinations between trivalent iron and phosphoric acid are crystalline only.

The crystalline modification of ferric phosphate can, as mentioned above, be obtained indirectly by crystallisation of the amorphous modification formed primarily by rapid precipitation from weakly acid solutions. It can, however, also be obtained directly by slow crystallisation from phosphoric acid solutions of between 5 and 35 per cent H_3PO_4, which are supersaturated with regard to iron. Another way to obtain the crystalline modification of ferric phosphate, which is described in detail later on, consists in its precipitation from a solution of the amorphous modification in phosphoric acid by dilution with a certain amount of water. The ferric phosphate is obtained in the form of small light rose-coloured crystals.

Here we have an analogy to the phenomena observed by Haber[5] during the formation of the hydroxides of iron and alumina. Depending upon the conditions of their formation, either amorphous sols or crystalline precipitates are obtained. The cause for this different behaviour cannot only consist in the rapidity of formation of the insoluble compounds in question, but must also be sought in surface-phenomena (adsorption) which impede the primary particles from growing to larger crystallites, while they may cling loosely together, forming disordered agglomerates.

Three Phenomena

If we consider the other compounds of trivalent iron with phosphoric acid, we find three remarkable phenomena:

1. There exist no compounds corresponding to the normal type of secondary or primary phosphates, as $Fe(H_2PO_4)_3$ or $Fe_2(HPO_4)_3$.
2. All these other compounds are, however, complex acids, iron forming the central atom with a different number of co-ordinated PO_4 groups in the complex.
3. All these combinations are crystalline only.

(*Continued overleaf*)

India's Surplus Alcohol

Compulsory Use to Safeguard Industry

PURSUING the general policy for the development of industries, the Government of India set up a panel to make recommendations regarding the development of the sugar, alcohol and food yeast industries during the post-war period. The most important recommendation made by this panel in respect of the power alcohol industry is the compulsory admixture of petrol with power alcohol in the proportion of 80 : 20. The recommendation is that the admixture should be made compulsory and gradually enforced throughout the country.

Wartime Industry

Before the war, India used to obtain about threequarters of her requirements of petrol from Burma. With the fall of Burma in 1942, India lost an important source of supply, and the Government of India encouraged the production of power alcohol as a substitute for petrol, and several distilleries were accordingly established during the years 1942 to 1944, particularly in the United Provinces and Bihar. Now that larger supplies of imported petrol are likely to be available at rates cheaper than those of power alcohol, these distilleries are threatened with extinction. The Government of India does not propose to allow such a situation to develop for two main reasons. First, the maintenance of the power alcohol industry as an alternative source of supply of motor fuel would be of considerable strategic importance in times of national emergency. Second, as one of the biggest sugar-producing countries in the world, India manufactures about 400,000 tons of molasses as by-product every year. Of this quantity about 150,000 tons are utilised for the manufacture of rectified spirit, methylated spirit, etc.; for the balance of 250,000 tons no permanent satisfactory use has been found.

This surplus will increase when new sugar factories come into production in furtherance of the general development plans. It would be in the national interest if surplus molasses, instead of being allowed to go to waste, were utilised for the production of power alcohol. This will not only mean the building up of a new industry but will ultimately reduce the price of sugar. It is estimated that if power alcohol is used in admixture with petrol in the proportion of 20 : 80, the price of the mixture will exceed the price of petrol by only a little more than one anna per gallon.

IRON COMPOUNDS *(Continued from page 649)*

The following combinations have been described[6]:—

(a) $H_3[Fe(PO_4)_2].4H_2O$: diphosphatoferric acid, whitish-yellow.
(b) $H_3[Fe(PO_4)_2].2.5H_2O$: diphosphatoferric acid, rose-coloured.
(c) $H_6[Fe(PO_4)_3].2H_2O$: triphosphatoferric acid, light rose-coloured
(d) $H_6[Fe(PO_4)_3]$: triphosphatoferric acid, light rose-coloured (hygroscopic).
(e) $H_9[Fe(PO_4)_4]$: tetraphosphatoferric acid, colourless (hygroscopic).

These compounds precipitate slowly from solutions containing H_3PO_4 and Fe at concentrations which result from the isotherm at 40°C. published by Bailer[7] and reproduced in Fig. 1.

The fact that all these combinations are complexes made Carter and Hartshorne as well as Bailer believe that ferric phosphate $FePO_4.2H_2O$ is also a complex compound, *i.e.*, the iron salt of diphosphatoferric acid, corresponding to the formula :—

$$Fe[Fe(PO_4)_2].4H_2O.$$

Because of the insolubility of ferric phosphate in water this question could not be decided by ordinary methods. With the help of an X-ray powder-diagram, however, it was possible to prove that $FePO_4.2H_2O$ cannot be an iron salt of diphosphatoferric acid but must be regarded as an ordinary salt of orthophosphoric acid (see later on).

In the liquid phase of phosphoric acid fertilisers (superphosphate) the conditions of concentration and temperature are such that only the crystalline form of ferric phosphate or diphosphatoferric acid with 4 or 2.5 molecules of water of crystallisation can exist.

For this reason the following work has been restricted to the conditions of formation and to the properties of these three compounds, *i.e.*, amorphous ferric phosphate, crystalline ferric phosphate, and diphosphatoferric acid.

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(To be continued)

I.C.I. CHEMICALS DIVISION

12,000 WORKERS AT 15 FACTORIES

FEW people in chemical industry could undertake to define offhand the scope and the numerous establishments which Imperial Chemical Industries, Ltd controls Several writers appear to have collaborated to provide in the November number of the I C I Magazine a fairly comprehensive study of the I C I's General Chemicals Division alone, and were hard put to it to compress into five pages of text and pictures an adequate mention of each of the division's ten principal factories and the purposes they serve

250 Principal Products

General Chemicals embraces in all 12,000 men and women, fifteen factories and produces some 250 principal products The structure of which these are the bare bones —says the review—is a complex one—inevitably so in a design subjected to so many diverse influences Examples of these are the location of nine factories in widely separated parts of the country the variety of products (from chlorine to lighter flints, from sodium to gelatine), the fact that each of the principal ones is made not in just one but in several of these factories the preponderating influence of electric power and the perhaps unusual extent of the technical services which must be given to users of the Division's products

The article goes on briefly to describe the network of plants and products of which the nerve centre is the Division Headquarters in the Cunard Building overlooking the Liverpool docks So diverse, however are the functions of the central control that even here they are not all to be found Supply and distribution for example, are concentrated in other headquarters sections at Runcorn, the research department is at Widnes, and the chief engineer's and power departments are at Weston Point, Runcorn

Widnes and Runcorn, formerly the heart of English chemical industry still contain two thirds of the division's total factory pay roll of nearly 10 000 workers That area is still the core of I C I's chemical structure

Largest of the chemical works is the Castner Kellner Works at Weston Point, with the largest installation of electrolytic mercury cells in the world A few miles away are the Rocksavage Works, which like the Hillhouse and Wade Works in the Fleetwood area is a former wartime factory operated for the Government and is now wholly under I C I control

Two Power Stations

The Gaskell Marsh and Pilkington Sullivan undertakings in the Widnes area represent the grouping into four factories of more than 12 works which 25 years ago were operating independently in the area Power for three electrolytic works and other operations in the area is generated by the Division's two main power stations at Weston Point and Widnes, which are now being substantially extended to provide a combined output of more than 100,000 kW

(*Continued overleaf*)

This represents little more than half of the vast Castner-Kellner installation on the banks of the Mersey, largest unit of the Chemicals Division

Other principal plants comprised in the General Chemicals Division are the St. Rollox works at Glasgow (which has been in being for 150 years), Chance and Hunt's at Oldbury and Wednesbury, the Netham works near Bristol, Cassel works on Teesside (in close proximity and association with the big undertaking of the Billingham Division). Two other chemical factories, Randle and Valley, are operated by the Division as agents for the Government.

Notwithstanding the diversity of chemicals produced, the two on which the division is essentially founded are chlorine and sulphuric acid. Chlorine is manufactured by three distinct electrolytic processes by six of the works: by electrolysis of brine in mercury cells at Castner-Kellner, Cassel and Rocksavage works and by electrolysis of brine in diaphragm cells at Pilkington-Sullivan, Hillhouse and Wade works, and, together with metallic sodium, by electrolysis of fused sodium chloride at Castner-Kellner and Cassel.

Chlorine for Bleaching Powder

Much of this chlorine is destined for other industries but still more is devoted to the division's own manufacturing processes, producing bleaching powder, hydrochloric acid, hypochlorites and particularly organic derivatives. Of the latter, trichlorethylene—especially for metal degreasing, drycleaning and solvent extraction—makes the greatest demand on the chlorine supplies.

The principal sources of the other key chemicals are the contact and lead chamber sulphuric acid plants at Gaskell-Marsh, Chance and Hunt and St. Rollox, although these are not the only ones. Sodium cyanide, and insecticides and weed killers, particularly I.C.I's own Gammexane and Methoxane, caustic soda, sodium sulphide, formic acid, vinyl chloride, hydrogen fluoride and cerium lighter flints are listed as among the products bulking largely in the total output of the General Chemicals Division.

The labour problems incidental to chemical enterprise on this scale are necessarily vast and the Personnel and Medical Departments carry a responsibility of even more fundamental importance than the many other executive sections. Nearly all who work in the I.C.I. factories are men—women are outnumbered 20 to 1. "Heavy chemicals manufacture," says the "I.C.I. Magazine," is essentially a man's job."

Indian Import Licences.—Licences for the importation into India of certain non-ferrous metals, which expired on June 30 this year, are automatically revalidated to cover shipments up to December 31. The materials concerned are copper, lead and scrap lead, and aluminium sheets and ingots.

Sulphuric Acid Statistics

Reduced Production in July-September

A SUMMARY of sulphuric acid and oleum production in the U.K. and Eire for the third quarter of this year, just issued by the National Sulphuric Acid Association, Ltd., reveals that production fell from 347,005 tons in the second quarter to 326,182 during the third, the main factor being a drop in the production of chamber produced acid from 170,710 tons to 149,745 tons. Quantities used were similarly affected, the respective figures being 175,887 tons and 154,119 tons. The figures below exclude Government plants except those producing acid for trade purposes.

Fertilisers represented, as usual, the source of the largest consumption of sulphuric acid and oleum. The Association's analysis of uses shows that the principal were: Superphosphates 94,629 tons, sulphate of ammonia 53,805, rayon and transparent paper 29,698, non pickling and tin plate 20,069, unclassified 18,460, dyestuffs and intermediates 16,727, paint and lithopone 14,912; hydrochloric acid 14,288, mineral oil refining 9315.

SULPHURIC ACID AND OLEUM

	Chamber only	Contact only	Chamber and Contact
	Tons of 100% H_2SO_4		
Stock July 1, 1947	36,216	32,002	68,308
Production ...	149,745	176,437	326,182
Receipts	37,208	24,305	61,513
Oleum feed ...	—	2,864	2,864
Adjustments ...	−305	−150	-455
Use	89,723	64,396	154,119
Despatches... ...	100,060	146,436	246,496
Stock Sept. 30, 1947	33,081	24,716	57,797
Total Capacity Represented	222,440	205,390	427,830
Percentage Production	67.3%	85.9%	76.2%

RAW MATERIALS

	Pyrites*	Spent Oxide	Sulphur & H_2S	Zinc Concentrates
	tons	tons	tons	tons
Stock July 1, 1947	84,285	149,812	52,563	20,566
Receipts	57,873	53,458	56,566	37,695
Adjustments ...	+233	760	- 441	
Use	66,262	48,130	51,540	41,010
Despatches ...	35 53†	3,849 220†	151 50†	26
Stock Sept. 30, 1947	76,041	155,311	56,947	17,225

* "Receipts" and "Use" include anhydrite "converted" to pyrites.

† Used at works for purposes other than sulphuric acid manufacture.

Less French Potash for Export.—French authorities have decided to allocate more potash to home consumers, thereby reducing the exportable quantities for the 1947-48 period to 240,000 metric tons, a reduction of 50,000 tons on the previous period.

Harnessing Heat From Reaction Vessels

Economies at a Russian Chemical Works

THERE are many chemical reactions that generate considerable quantities of heat. This heat must generally be dissipated and for that purpose cooling water or a flow of cooling gas is often used—notes the *Fuel Efficiency News*. It frequently happens that in a single chemical works there are reactions which generate heat and others to which heat must be supplied. Such physical operations as evaporation, distillation, and the preheating of materials also require external heat.

Convenient Heat Exchange

It is very desirable that heat should be circulated from the reactions and operations that evolve heat to those for which additional heat is required. If the two sets of reactions can be combined in one apparatus, so much the better. Unexpected advantages sometimes accrue from the consequent change in works layout as will be seen here.

An interesting example of a works reconstruction based on these principles was recently given in the Russian paper, *Promyshlennaya Energetika*. The author of the article was called upon to reconstruct a works in which steam from the boilers was used in an evaporator to heat a liquid (by indirect heating); a gas was saturated with the vapour from this liquid by being circulated through the evaporator before passing to the reaction vessels. In the reaction vessels so much heat was generated by the chemical reaction that, in spite of water-cooling, parts of the apparatus became red-hot and required frequent replacement. The cooling water was discharged down the drain.

In the reconstructed layout cooling water was passed from a gravity-feed tank through the jackets of the reaction vessels, where it attained a temperature of 90°C. (194°F.). It was then used in place of live steam to supply the necessary heat to the evaporator. From the evaporator the water was discharged to a sump and was then pumped again to the gravity-feed tank for re-use. A by-pass valve on the delivery side of the pump served to regulate the flow of water.

At this works peat is used as fuel, and as a result of the reconstruction here described, 2400 tons of peat a year are stated to have been saved, together with 12 million gallons of water.

Self-Regulating

In addition to the direct saving of materials the new arrangement enabled the thermal conditions of the process to become automatically self-regulating. This is an interesting consequence of the new method of working and comes about in this way. If the temperature becomes reduced in the evaporator because the reaction vessels are running cooler, the process gas picks up less vapour, and the effect in the reaction vessels is such as to cause the temperature there to rise; this rise in temperature increases the temperature of the cooling water, and thus corrects the original irregularity by increasing the rate of evaporation of vapour in the evaporator. The difficult hand-regulation previously needed was thus avoided, with reduction in the number of breakdowns previously caused by the inevitable human factor.

Maintenance Costs Reduced

The more regular operation and the smaller fluctuations of temperature in the vessels resulting from the changed method of working also led to reduced maintenance costs and to a 50 per cent increase in working periods between overhauls. The plant output was increased 25 per cent, and experience showed also that the quality of the product was considerably improved so that the proportion of rejects was greatly reduced.

SCIENTIFIC LEASE-LEND

A PLAN to boost the export of scientific laboratory equipment from the United States to other countries, in line with the recent recommendations of the President's Scientific Research Board, has been set in motion through a 2,500,000-dollar revolving fund opened by the United States Export-Import Bank.

While the Bank generally extends credits to increase the productive and export facilities of the borrowing country, this plan is particularly designed to fit the scientific needs of foreign countries. It cannot be applied to American exports indiscriminately, the Bank states.

Pivotal point of the science-export plan is a private organisation of manufacturers and exporters of scientific equipment—the United States Scientific Export Association. From the revolving credit the association will extend loans to its foreign customers for numerous small purchases, with the loans covering a portion of the purchasing price. The credits carry 4½ per cent interest and are repayable within a maximum of five years.

Hydrogenation by Dissociated Ammonia

A PRACTICAL hydrogenation method which successfully used dissociated ammonia as a hydrogenation gas has been developed by Armour & Company, it was disclosed at a recent meeting of the American Oil Chemists' Society in Chicago, Illinois. The process consists of five major steps, as follows :—

1. Conversion of liquid ammonia under pressure to a gas of low pressure.
2. Cracking of the ammonia at a high temperature and low pressure in a retort using a nickel catalyst.
3. Removal of the residual ammonia (0.05 per cent) from the mixture of hydrogen and nitrogen.
4. Compression of the mixed gases.
5 Hydrogenation of fatty materials using the mixed gases.

Lard and cottonseed oil have so far been hydrogenated by this method. Hydrogen consumption figures and hydrogenation rate values have been compared with results obtained from the use of purified steam-iron hydrogen as a control gas. Qualitative hydrogenation has been made of nitriles and fatty acids. Satisfactory yields of primary amines have been obtained from the nitrile hydrogenation, and the fatty acids hydrogenated to iodine values below 5.

The cost of producing hydrogen gas by dissociating ammonia is economically attractive where requirements are not sufficient to warrant more expensive equipment.

Another subject discussed at the same meeting was the hydrogenation of raposeed oil. This has been subjected to pressure hydrogenation in a small hydrogenator. Various temperatures and pressures have been used, keeping a constant percentage of finely divided nickel catalyst. The progress of the process can be studied by removing supplies periodically, converting them into methyl esters, and fractionation and analysis of the various fractions for unsaturated fatty acids by ultra-violet absorption.

The above method for determining the composition of fatty acid content was also applied with success to a sample of oil extracted from yellow mustard seed from the Punjab.

Hungarian Minerals Monopoly

A virtual State monopoly of the Hungarian mining industry is reflected by the statement from the Hungarian Statistical Office that of the 88 coal mines not less than 82 are State-owned, employ 89.6 per cent of all miners, and produce 91.7 per cent of the total coal production of the country. Of the five iron ore mines three belong to the State, and are responsible for 99.9 per cent of the total production.

Next Week's Events

TUESDAY, NOVEMBER 18

Society of Chemical Industry (Agriculture Group). Physical Chemistry Lecture Theatre, Royal College of Science, Imperial Institute Road, S.W.7, 2.30 p.m. R. S. Cahn : " The Rôle of Chemistry in Recent Developments of Animal Insecticides." Chemical Engineering Group and Physical Society. Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 5.30 p.m. P. M. Schuftan : " A New Process for the Separation of Ethylene from Coke Oven Gas."

Royal Society of Arts (Dominions and Colonies Section). John Adam Street, Adelphi, W.C.2, 2.30 p.m. Dr. J. G. Malloch : " Scientific Research in Canada and its Links with Science in the United Kingdom." (Neil Matheson McWharrie Lecture.)

Society of Dyers and Colourists (Scottish Section). St. Enoch Hotel, Glasgow, 7 p.m. Dr. Landolt : " Improvement of the Properties of Fibres and Dyeings by Treatment with Hydrophobic Helamine-Formaldehyde Compounds."—Midlands Section. Victoria Station Hotel, Nottingham, 7 p.m. Dr. E. S. Paice : " Petroleum Chemistry as applied to Textiles."

WEDNESDAY, NOVEMBER 19

Royal Institute of Chemistry (London and S.E. Counties Section). Wellcome Research Institution, 183, Euston Road, N.W.1, 6.30 p.m. Annual general meeting. Scientific Films.

Institution of the Rubber Industry (Southern Section). The Polygon Hotel, Southampton, 7.15 p.m. Mr. F. H. Cotton : " Developments in Processing and Vulcanising Rubber."

THURSDAY, NOVEMBER 20

The Chemical Society. Burlington House, Piccadilly, W.1, 7.30 p.m. H. Mackle and A. R. Ubbelohde : " A Thermo-chemical Evaluation of the Bond-strength in some Carbon Compounds. Part I (Methyl carbon)-iodine and (Methyl carbon)-magnesium," ; G. E. Coates and L. E. Sutton : " The Heats of formation of the $N{=}N$ and $C{=}N$ bonds " ; D. J. G. Ives and R. W. Pittman : " The Photo-chemistry of Selenium, Part I. The Photochemical Oxidation of Hydrogen Selenide."

The Royal Society. Burlington House, Piccadilly, W.1, 2.30 p.m. E. C. Bullard : " The Results of the Heligoland Explosion." 4.30 p.m. Special general meeting.

Society of Chemical Industry (Plastics Group and Road and Building Materials Group). Mansion House, 28, Portland Place, W.1, 6 p.m. V. Evans : " Corrosion-Resistant Cements."

FRIDAY, NOVEMBER 21

Society of Dyers and Colourists (Manchester Section). Gas Department Showrooms, Town Hall Extension, Manchester, 7 p.m. C. P. Tattersfield : " The Effect of Physical Pretreatment on the Ease of Saponification of Cellulose Acetate Rayons and Films."

Royal Institute of Chemistry. Geological Society, Burlington House, W.1, 6 p.m. G. Taylor : " Streatfield Memorial Lecture." (Institute Meeting.)

SATURDAY, NOVEMBER 22

Royal Institute of Chemistry (London and S.E. Counties Section). Brighton Technical College, Brighton, 5.45 p.m. J. G. N. Gaskin : " The Examination of Questioned Documents."

Home News Items

Gas Price Increase.—Gas supplied by the Metropolitan Gas Company is increased by ½d. per therm with effect from Wednesday last.

Change of Address.—The British Rubber Development Board has removed to Market Buildings, Mark Lane, E.C.3.

Beet Problem for Chemists.—The occurrence of an unexpected chemical reaction during the processing of this year's beet crop is reported to have so dislocated manufacturing operations that chemical experts have been consulted.

Retail Sales Rise.—A national survey of retail sales in September last shows that sales by independent chemists—a representative group numbering 227—were 12 per cent higher than in September, 1947. Sales of chemists' wares by large-scale retailers increased 33 per cent.

Resistant Coatings.—Paint and varnish manufacturers since 1789, Denton and Jutsum are renewing their participation at the Building Exhibition after a lapse of many years. Among the company's specialities are anti-corrosive, alkali and acid-resisting paints, and material for freeing rusted and corroded metals, bolts, nuts, screws, bearings, valves and machinery.

Building Plans Suspended.—Plans for the erection of five new factories on the Bromborough Port Industrial Estate, Cheshire, have received a setback owing to the steel shortage. There is little hope of the Ministry of Supply granting licences for four of them because of the requirements of steel in their construction. The fifth, designed to recondition steel drums, may be sanctioned.

Explosion at Iron Works.—Five men and a youth were badly burned, two of them seriously, when half a ton of molten iron which had been poured from a smelting furnace exploded last week, in a vat at the Firhill Iron Works of Shaw and M'Innes, Ltd., Glasgow. Moisture in the vat is believed to have caused the explosion. The metal was being prepared for casting piping for export.

Three Works Fires.—Three serious fires have occurred this week in the Lancashire area: at the I.C.I. works at Barn Naze, near Fleetwood on November 10 when large quantities of packing materials were destroyed; at Brotherton's tar works, Litherland, near Liverpool on November 11, when about 25 tons of tar were consumed; and on November 10 at a very large rubber dump belonging to the N.W. Rubber Co., at Hightown, near Liverpool. In the last-mentioned incident the entire contents of the dump (about 20,000 tons) are believed to be a complete loss.

153,000 Tons More Coal.—Coal production last week totalled 4,243,000 tons, an increase of 153,000 over the previous week. There are now seven weeks left in which to reach the Government's target of 200 millions.

Wholesale Chemical Prices.—Chemicals and oils rose in value to 186.4 (1938 = 100) in October, according to the Board of Trade review of wholesale prices of industrial materials. The index number in September was 183.3 and in the previous month 175.4.

Chemical Export Department.—Aikman (London), Ltd., which for many years has specialised almost exclusively in sales of nitrate of soda and similar nitrogenous products, has opened a new export department for agriculture and industrial chemicals and dyes.

Best Export Total?—Among North-East coast firms with substantial claims for inclusion among Sir Stafford Cripps' export "target busters," is the Washington Chemical Works, where the current production is at a rate equivalent to twice the official target for 1948, and more than three times the 1938 rate. The firm manufactures magnesium products, and claims to be one of the biggest bulk exporters in the area, with about half of present production being shipped overseas.

Detergent and Polish Plant.—R. P. Adam, Ltd., manufacturing chemists of Galashiels, have completed the final stage of a very considerable extension scheme started in 1946. In connection with this expansion, the firm plans the launching of several new products in the polish, detergent, cleaning and allied fields. A 27,000-sq. ft. disused mill has been adapted to form five modern shops designed to produce polishes, cleaners, detergents, chemical preparations, soaps and perfumes. The whole is designed for a straight-flow mechanisation system.

Value of Ambulance Teams.—Presenting St. Andrew's Ambulance Association medals in Glasgow last week to employees who had completed 15 or more years' service, Sir John Craig, chairman of Colvilles, Ltd., expressed the opinion that trained ambulance men were of much greater value in the works than the nurses or the resident doctor that the authorities advised. They were able to render aid at any hour of the day, and neither a nurse nor a doctor could be so readily available. Ten employees—including three brothers—received medals and a gift from the directors of the firm. They are all members of the Advisory Committee of the Dalzell works section.

PERSONAL

Mr. F. Hammond of the London overseas department has been appointed district manager of Dunlop South Africa, Ltd.

Dr. William A. Hamor, of the Mellon Institute, Pittsburgh, Pa., has been appointed editor of the Chemical Monographs of the American Chemical Society.

Mr. Gerald Steel has been appointed joint managing director of United Steel Companies, Ltd., with the chairman Sir Walter Benton Jones.

Mr. G. E. Beharrell, managing director of the Dunlop Rubber Co., Ltd., has been elected president of the Tyre Manufacturers' Conference in succession to the late Sir Harold Kenward.

Lord Leverhulme, Mr. G. A. S. Nairn (chairman) and other members of Lever Brothers, together with a number of prominent industrialists and works representatives, attended a service at Christ Church, Port Sunlight, on November 2, in memory of Lieut.-Col. Ernest Briggs, the late chairman of Lever Bros. (Port Sunlight), Ltd.

New Fellowships

Among new Fellows elected to the Textile Institute are the following:—

Mr. W. Von Bergen, of New Jersey, U.S.A., who served in the European theatre of war as a scientific consultant to the U.S. Army, and is director of research and laboratories at the Forstmann Woollen Co., Ltd., Passaic, N.J.

Dr. B. R. Roberts, formerly Professor at Instanbul University, and now group leader at Monsanto Chemical Co., Dayton, Ohio, U.S.A.

Mr. H. Marsden, of Gatley, Cheshire. Mr. Marsden is sales manager and technical assistant of the Universal Winding Co., Manchester.

Chemical Club Officers

At the annual general meeting of the Chemical Club, held at Whitehall Court, London, recently, the following officers and committee members were elected to serve during the 1947-1948 session:—President, Mr. T. H. Fairbrother; chairman of Executive Committee, Mr. S. I. Levy; hon. secretary, Mr. A. J. Amos; hon. treasurer, Mr. R. L. Stephens.

Committee: Messrs. E. A. Bevan, Eric Chilman, H. W. Cremer, W. Dixon, F. A. Greene, F. J. Griffin, E. H. T. Hoblyn, Osman Jones, J. H. Robertson, and J. F. Ronca.

The Council of the Institute of Welding has awarded the Sir William J. Larke Medal and a prize of £50 to Mr. J. Corston MacKain, of Edinburgh, for a paper on the evolution of welded components in house construction and welded bunkers for power houses. Papers submitted by Mr. J. R. Ferguson and Dr. H. Gottfeldt, were highly commended.

Mr. G. I. Rushton, managing director of Timothy Whites and Taylors, Ltd., and associated companies, has been appointed vice-chairman of the group.

Mr. R. C. Terry, before the war a research chemist of J. & J. Colman, Ltd., and an R.E. and R.A.S.C. officer during the war, has been appointed to the Colonial Service as assistant government chemist at Hong Kong. He graduated M.Sc.

Mr. John Cunliffe, of Ramsbottom, Lancs., proprietor of the Irwell Chemical Works, Ramsbottom, who died on March 16, aged 74, left estate estimated at £26,206, net personalty £20,437.

Professor Glenn T. Seaborg, of the University of California, co-discoverer of plutonium, has received the 1948 award of the William H. Nichols Medal of the New York Section of the American Chemical Society.

Mr. John Wilson, formerly director of research to the British Rubber Research Association, has been appointed to a similar post with the British Rayon Research Association.

Sir Harold Kenward

A research fellowship in industrial administration is to be founded at St. Catherine's College, Cambridge, as a memorial to Sir Harold Kenward, Dunlop's director of distribution, who died on the *Queen Elizabeth* on his way to America. The trustees are seeking to raise £25,000 to found the memorial.

American Chemist Honoured

Dr. George Washington Carver, the renowned U.S. agricultural chemist who died on January 5, 1943, is to be honoured by an issue of United States postage stamps bearing his portrait. The stamps will be released on January 5, 1948, and a chemist's crucible will appear in the design. Dr. Carver's experiments with agricultural products, especially the peanut and sweet potato from which he derived more than 400 industrial or commercial substances, contributed greatly to economic advancement of several States.

Obituary

Mr William M Connachie, retired analytical chemist, formerly with Coltness Iron Co., Ltd., Glasgow, died on November 4, at Newmains, Glasgow.

American Chemical Notebook

From Our New York Correspondent

AT least one American observer is satisfied that the chemical industry of the U.K. is destined for nationalisation and is sufficiently confident to predict the date. The prophet is Mr. C. C. Concannon, chief, drugs and chemicals division of the Office of International Trade, United States Department of Commerce. Addressing a meeting of the executive committee of the international trade section of the New York Board of Trade a few days ago., he predicted that between 60 and 75 per cent of the British chemical industry would be nationalised by 1950 or 1951. He said immediate nationalisation was ruled out, since it must be preceded by nationalisation of the gas and steel industries. He was doubtful whether Imperial Chemical Industries would ever be nationalised, in spite of the general socialistic character of the Labour Government. "This organisation, which has often been referred to as a monster," he said, "is too well managed to stand in danger of nationalisation shortly and may well escape such a fate permanently." Mr. Concannon, who has recently returned from a tour of eight European countries, said that most encouraging indications of economic recovery are to be found in Belgium, Luxembourg, and the Netherlands. This BENELUX region now had a chemical output of 100 to 125 per cent in excess of prewar levels. By contrast, France's current chemical production stood at only 70 per cent of pre-war. No accurate estmate of production in Germany was possible at the present time.

* * *

Ammonium nitrate fertiliser and trifluorochloroethylene have been added to the list of explosives and other dangerous articles of the Interstate Commerce Commission. The announcement of this in Washington, D.C., this week notes that hereafter a yellow label will be required for ammonium nitrate shipments and the maximum quantity that may be shipped in one outside container by rail express will be 100 lb. Added to the I.C.C. list of dangerous materials were radioactive substances under class Poison D. Specifications have been set up for labelling, packing and shielding, shipping containers, loading and unloading, and the handling by rail freight and express carriers of these materials.

* * *

A U.S. Government-owned patent, No. 2,419,945, covering froth flotation of silica from iron ore has been made available for licensing on a non-exclusive royalty-free basis by the Secretary of the Interior. The patent describes the preparation (for smelting) of iron ore containing calcareous and siliceous impurities. Gangue is floated from the pulverised iron oxide by adding hydrated lime (16.5 to 41.8 lb. per ton) to establish a pulp pH of about 12 by substantially saturating the pulp with dissolved lime. An anion-active collecting agent such as tallol or oleic acid is added, and the pulp subjected to agitation and aeration so that the siliceous gangue is floated and the concentrated iron ore recovered in the usual way. The Solicitor, Department of the Interior, Washington 25, D.C., is the authority for licensing.

* * *

"A new chemical industry, based on allyl chloride obtained by the chlorination of propylene, holds promising possibilities," Mr. S. D. Kirkpatrick, past president of the American Institute of Chemical Engineers, told a conference on "Process Equipment" in San Francisco, last week. "From it," he said, "have already come new solvents, the new soil fumigant 'D-D' allyl starches, acrolein, acrylonitriles and, within another year, we shall have synthetic glycerol *via* allyl cloride. "Also in the limelight are two types of development of chemicals from natural gas: the synthol plants using the Fischer-Tropsch process to synthesise motor fuel—at the same time producing a stream of water-soluble oxygenated hydrocarbons, alcohols, aldehydes, ketones, acids, etc.—and the oxidation plants where propane and butane are oxidated catalytically to produce acetaldehyde and many related chemicals.'

Atomic Power: 5 or 10 Years ?

VIEWS on the length of time which is likely to elapse before atomic energy is harnessed to industry on a substantial scale were expressed in Liverpool last week on the occasion of the launching of the atomic energy travelling exhibition: **PROF. N. F. MOTT** (Bristol University) : "If the economic conditions of the country are favourable my guess would be in ten years. But we could not do that if we do not have a good coal supply and a flourishing engineering industry."

PROF. H. L. PRYCE (Oxford University) : "In five years' time I think there would be running a demonstration power station, to prove that it was possible to convert uranium into electricity. In ten years' time there might be a moderate-sized power station, and in 25 years' time a power station supplying the major proportion of the country with electricity."

PROF. H. W. MASSEY (London) · "I entirely agree with the remarks of Professor Pryce."

Overseas News Items

French Coal Output.—Coal production in France during October amounted to 4,625,000 tons, the highest monthly figure this year.

Oil Discovery.—Standard Oil Co. of California has discovered oil 150 miles south-east of Calgary, Canada. The well was drilled jointly with the Imperial Oil Co., Ltd.

Brazilian Petroleum.—A U.S. tender of $2,235,000 has been accepted for the provision in Bahia of a refinery of 2500 barrels daily capacity, which is to be the centre of the petroleum industry in Brazil.

$15,200 Million Industrial Expansion.—American business, exclusive of agriculture, expects to spend a total of $15,200 million for the construction of new plants and the purchase of new equipment. If such planned expenditures are carried out, they will be approximately 25 per cent above the amount spent in 1946, and 85 per cent higher than in 1941.

International Pharmacopoeia.—Arrangements for an international pharmacopoeia have been made at a Geneva meeting of the World Health Organisation of the United Nations and the work will soon be available to the world, stated Dr. C. H. Hampshire, secretary of the Pharmacopoeia Commission, at the dinner of the Pharmaceutical Society of Great Britain.

German Soap-Making Materials.—The Krefeld Urdingen plant of the I.G. Farben and the Chemische Werke of the " Rheinpreusse " mines report that after several months' preparation their output is now expanding. Production of basic materials for pharmaceuticals and coal-tar colours has been scheduled. Manufacture of raw materials for soap and methanol for the pharmaceutical and plastic industries is included in the production plan. The Rheinpreussen Company has also taken up manufacture of soap materials. It is doubtful whether the production of synthetic fats will relieve the scarcity in technical fats.

Electro-Technical Plant Expanding Production.—The industrial combine Elektrotechnisches Kombinat Bitterfeld, Eastern Zone, which improves light metal scrap after a process by Dr. Beck, is now manufacturing spindles, pumps and beds from light metals. The company also manufactures plastics, and is maker of shoes, lampshades, etc., from igelit. Washing materials, caustic soda, potash, soup-cubes, are also made in Bitterfeld, where fertilisers, too, are being produced. In 1948 the firm will take up on a large scale the manufacture of an insecticide to fight colorado beetles. Nearly 12,000 technicians and workers are now employed.

Australian Discovery.—Discovery of a highly radio-active, black resinous mineral in the Hartz Mountains has been reported from Melbourne.

Fewer Casualties.—Industrial injuries in the U.S.A. diminished in the second quarter of this year to 15.7 per million hours worked, the lowest rate for five years. The figure in the same period for 1946 was 18.1.

German Chemical Production.—The chemical manufacturing firm of Schering in the Eastern Zone of Germany, is reported to be once again producing all its pre-war range of patent drugs; penicillin, too, is in production.

Ceylon to Prohibit Rubber Imports.—Among recommendations made recently by the Ceylon Commission for the rubber industry are prohibition of manufactured rubber imports where such articles can be made locally, protective tariffs for certain rubber goods, the establishment of State-aided factories for the manufacture of motor and bicycle tyres, and the setting up of an adequate organisation to undertake rubber research.

Canadian Results.—Commercial Alcohols, Ltd., reports net profit of $69,715 for the year ended March 31, 1947, equal after preferred dividends to 24 cents per share on 200,515 common shares. This compares with $66,902 or 23 cents per common share in the previous year. The report says the year was the most difficult in the company's history. Consolidated net profits of $370,387 are reported by Standard Chemical Co., Ltd., for the year ended March 31, 1947, compared with $287,407 for the previous fiscal year. Provision has been made for preferred dividends of 60 cents a share on common shares outstanding.

Chromium and Aluminium in Rumania.—Chromium ore deposits recently discovered in a south-western province of Rumania, near the Danube, are reported to contain 40-50 per cent of chromium. The total deposits are estimated to hold two million tons. The Rumanian Government is taking steps to eliminate technical and financial difficulties that are hindering the production of aluminium. Up to the present only one firm manufactures aluminium, but it has had to stop production for the time being. Several million tons of aluminium ore, discovered by the Germans during the first world war, are available in the central mountains of Transylvania, but those fields have not yet been exploited. At some places the ore is lying on the surface and it is estimated that it contains 60 per cent aluminium, and 30 per cent iron.

Canadian Caustic and Chlorine Plant.—Construction has started on a new chlorine and caustic soda plant for the Dominion Alkali & Chemical Company, a subsidiary of Dominion Tar & Chemical Co., Ltd., at Beauharnois, Quebec. Initial construction operations will consist of building roads and railroads to the site and erecting a building to serve as offices for construction personnel. The plant, which will have a rated daily production capacity of 60 short tons of chlorine and 67 tons of rayon-grade caustic soda, is expected to be in operation on January 1, 1949. High-strength, rayon grade caustic soda will be produced without the use of special evaporating equipment.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

JOHNSON AGENCIES (PROPRIETARIES), LTD., Horsham, manufacturing chemists. (M., 15/11/47.) October 15, charge, to Barclays Bank Ltd., securing all moneys due or to become due to the Bank; charged on 32-40 (even) North Street, Horsham. *Nil. December 31, 1944.

Satisfactions

RIO TINTO CO., LTD., London E.C., copper mining company. (M.S., 15/11/47.) Satisfaction October 2, £2,000,000, registered April 30, 1931.

LANGLEY ALLOYS, LTD. (Bucks.). (M.S., 15/11/47.) Satisfactions October 9, of debenture stock registered November 7, 1942, and debentures registered November 22 and December 5, 1946 (all fully).

Company News

Fisons, Ltd., has increased its share capital by the issue of 1,000,000 4½ per cent cumulative preference shares of £1 each at 23s. per share.

The nominal capital of **Foam-Bar, Ltd.**, chemical manufacturers, etc., 181 Baker Street, London, W.1, has been increased beyond the registered capital of £100 by £900, in £1 ordinary shares.

New Companies Registered

Strathclyde Chemical Co., Ltd. (25,859).—Private company. Capital £10,000 in £1 shares. Directors: J. A. Biggart, A. S. Biggart, and W. M. Biggart. Registered office: 105 West George Street, Glasgow, C.2.

Marvos Chemical Manufacturing Company (Luton 1947), Ltd. (444,776).—Private company. Capital £250 in 250 shares of £1 each. Manufacturers of and dealers in chemicals, disinfectants, fertilisers, boot, shoe, furniture, leather and floor polishes, etc. Directors: F. T. Day, and D. W. Gooden. Registered office: 19-20 Grosvenor Place, S.W.1.

Maynard's Chemists, Ltd. (444,723).—Private company. Capital £100 in 100 shares of £1 each. Manufacturing, pharmaceutical, photographic, advising and dispensing chemists and druggists, etc. Directors: G. J. N. Maynard and Winifred G. Maynard, and Kathleen M. Collins. Registered office: 143 Cann Hall Road, Leytonstone, E.11.

Emcer Products, Ltd. (444,757).—Private company. Capital £2625 in 2500 "A" shares of £1 and 2500 "B" shares of 1s. Manufacturers of and dealers in dyes, dyestuffs, pigments, auxiliaries for piece goods and textiles, finishing and softening materials, chemicals, chemical and other products, etc. Directors: S. Bradley and J. Bradley, S. Arnold, and C. G. Badrick. Registered office: Palmerston House, Bishopsgate, E.C.

Chemical and Allied Stocks and Shares

ALTHOUGH Budget uncertainties further restricted business at the beginning of the week, British Funds remained firm on the assumption that Mr. Dalton's proposals will have the effect of boosting gilt-edged stocks. Industrial shares must now be expected to undergo a period of adjustment to the implications of the Budget, although it is not easy to assess how the incidence of taxation will bear on individual companies. The latest coal output figures created an excellent impression, particularly as this follows a record rate of steel production. It is realised that coal and steel are the main factors than can combat the economic crisis and speed the export drive.

As was to be expected, chemical and kindred shares moved closely with the general trend in industrials, but on balance were mostly within a few pence of the levels current a week ago. There are now two relatively unknown factors which must have an important bearing on future financial results, namely, the incidence of taxation and the extent to which individual companies can reach their targets. Nevertheless, despite these uncertainties there has not been much selling. It is realised that selling of leading chemical and kindred shares would have little in its favour because of the difficulty of obtaining alternative investments with as good possibilities and prospects. The chemical industry must play an important part in export trade as well as at home, and so far as can be judged, in most cases there seem reasonable prospects of dividends being maintained. Imperial Chemical eased to 47s. 7½d., but were later 48s. 6d., and now yield 4⅛ per cent on the 10 per cent total dividend which is generally expected to be maintained. Fisons remained steady at 64s. 4½d., helped by the statement in the prospectus issued in connection with the issue of 4½ per cent preference shares, that profits for the nine months to June compare favourably with those of last year. It is added that production of all kinds of chemical fertilisers is running strongly, and the needs of agriculturists at home and overseas are still far from being satisfied. British Glues & Chemicals 4s. ordinary shares have strengthened to 20s. 9d. W. J. Bush were 82s. 6d., and B. Laporte 83s., while elsewhere, Major & Co.'s 2s. shares have changed hands around 2s. 9d., and Lawes Chemical were 13s In response to market dividend estimates which range up to 100 per cent (compared with the previous year's 80 per cent) Blythe Colour 4s. shares have risen to 60s. Elsewhere, however, Levers receded to 51s., Turner & Newall were 73s. 1½d., and Dunlop Rubber at 71s. 9d. lost part of an earlier rise. United Molasses eased to 47s. prior to the Budget, but Wall Paper Manufacturers deferred were better at 43s. 9d. British Aluminium strengthened to 47s. 3d., and Imperial Smelting further improved to 21s. 3d. In the paint section, Lewis Berger changed hands up to close on £8 on higher dividend hopes, while Pinchin Johnson (56s.) were higher on balance.

The latest coal production figures maintained firmness in iron and steels, where Dorman Long were good at 27s. 6d. in view of the company's big Tees-side plans. Whitehead Iron at £5¼ strengthened following the unchanged interim dividend, while United Steel 26s. 6d., Colvilles 28s., Guest Keen 47s. 9d. all recorded further gains. In other directions, Courtaulds eased to 13s. 9d., and textiles generally were dull, it being realised that achievement of export targets depends on an adequate flow of labour to the mills. Boots Drug at 55s. 9d. were little changed on balance, but elsewhere, Beechams deferred eased to 22s. Tube Investments strengthened to £6⅜ pending the dividend announcement, but Triplex Glass (32s. 9d.) failed to hold all an earlier improvement. Oils were more active, with Shell better at 76s. 10½d., awaiting the new issue terms. Apex (Trinidad) rose to 42s. in response to higher dividend hopes.

British Chemical Prices

Market Reports

ACTIVE trading conditions have been reported from most sections of the industrial chemicals market with contract deliveries well up to schedule. A good volume of inquiries for new business is also reported although in some instances definite shortage of suitable containers continues to hamper the export of both heavy and fine chemicals; it is hoped that some improvement in the position will result from the representation made by the trade associations. The general situation as far as supplies are concerned has not worsened, but much leeway has yet to be made up if home and overseas requirements are to be fully met. The white and red leads are in good call at unchanged rates, while there is a good demand for acetone, formaldehyde and the heavy acids. Among the soda products, caustic soda, bicarbonate of soda and soda ash are in active request, and values throughout this section are well held. Demands for the potash products remain in excess of available supplies. There are no new features in the coal-tar products market, and most items in this section are well covered by forward bookings.

MANCHESTER.—Sellers of heavy and other descriptions of chemical products seem to be increasingly disposed to adopt a cautious attitude in regard to fresh booking and, so far as the Manchester market is concerned, additional business in most sections is less a matter of what buyers are ready to place than of what sellers are ready to accept. In the meantime, prices are very firm in almost all departments. Industrial users generally, including the textile and allied trades, are specifying for steady deliveries against old orders. A fair trade is passing in fertiliser materials, with basic slag, lime and superphosphates probably the busiest sections. Tar products generally, both light and heavy, are in good demand.

GLASGOW.—All grades of light and heavy chemicals showed activity last week in the Scottish chemical market. Prices are still tending to rise, the increase in the main being a reflection of increased freight rates and cost of packages. There are indications that there will be a shortage of bleaching powder, although most large users have reasonable stocks at the moment. There is still a considerable demand for substitute materials. In the export market shortage of suitable packages is still causing anxiety and delay in delivery. Trade with Greece has been restricted due to financial regulations, but it is believed that the position is now easing. Great difficulty is still being experienced by buyers in Spain in obtaining import licences. Firm orders have again been received on about the average scale, and inquiries remain numerous.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Process for the separation of carbonates of magnesium and calcium.—Basic Refractories Inc. May 8, 1943. 15040/1945.

Manufacture of copper base alloy products.—Bridgeport Brass Co. July 15, 1942. 23219/1944.

Cellulose ether derivatives, and process for producing the same.—Carbide & Carbon Chemicals Corporation. Oct. 19, 1940. 14240-41/1941.

Manufacture of azo-dyestuffs.—Ciba, Ltd. March 1, 1946. 5796-97/1947.

Manufacture of tetrahydrophenanthrene carboxylic acids and derivatives thereof.—Ciba, Ltd. March 7, 1946. 6227-9/1947.

Manufacture of hydrophenanthrene monocarboxylic acids and derivatives thereof.—Ciba, Ltd. March 7, 1946. 6334-6/1947.

Manufacture of rosin-styrene interpolymers.—Dow Chemical Co. March 1, 1946. 4562/1947.

Coating compositions.—E.I. Du Pont de Nemours & Co. March 2, 1946. 5805/1947.

Manufacture of halogenated acrylic acids. —E.I. Du Pont de Nemours & Co. March 4, 1946. 6123/1947.

Production of polymeric materials.—E.I. Du Pont de Nemours & Co. March 4, 1946. 6124/1947.

Production of fluorinated carboxylic acids.—E.I. Du Pont de Nemours & Co. March 7, 1946. 6425/1947.

Production of phosphoric esters.—Eastman Kodak Co. Dec. 8, 1943. 21968/1947.

Polymeric material and process of producing same.—B. F. Goodrich Co. March 2, 1946. 5293/1947.

Electrolytic apparatus.—I.C.I., Ltd.—March 2, 1946. 5981/1947.

Treatment of cellulosic materials with polyisocyanates and polyisothiocyanates.—I.C.I., Ltd. Feb. 27, 1942. 21961/1947.

Modifying the properties of organic substances with polyisocyanates, polyisothiocyanates, etc.—I.C.I., Ltd. May 24, 1939. 21962/1947.

Refining of naphthalene.—Koppers Co., Inc. March 30, 1943. 427/1946.

Acetylene compounds.—Koppers Co., Inc. Feb. 7, 1946. 20360/1946.

Acetylene compound.—Koppers Co., Inc. Feb. 7, 1946. 20361/1946.

Chemical processes and products.—Merck & Co., Inc. March 2, 1946. 4966/1947.

Processes of preparing new organic compounds of silicon and the compounds resulting from said processes.—Minnesota Mining & Manufacturing Co. Dec. 31, 1942. 21863/1947.

Production of N, N-diakylamino alcohols.—Monsanto Chemical Co. Oct. 29, 1942. 16696/1944.

Detergents and processes of preparing the same.—Monsanto Chemical Co. May 14, 1940. 17868/1944.

Process for the complete or substantial removal of free acid from mixtures containing free acid and acid alkyl esters.—N.V. de Bataafsche Petroleum Maatschappij. Oct. 19, 1939. 22449/1947.

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SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 *and* 50 *inclusive, or a woman between the ages of* 18 *and* 40 *inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.*

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Education and the Scientist

WE had occasion lately to study a document by a chemist purporting to be a report on a new process. It was intended to convey the result of an investigation, enabling the reader to decide whether or not the process satisfied the claims for it. In fact it did nothing of the kind; he failed to make clear what was the method of test, the manner in which the test was done, or the results achieved. That was a pity because the tests appeared to have been comprehensive, and the chemist evidently had something worth conveying. What that was will, unfortunately, never be fully disclosed.

We are not alone in this plaint. Dr. Ulick Evans has recently spoken at Cambridge of the "many senior members (of the University) who are at present giving up far too much of their time trying to teach the young men the art of expressing their ideas in writing, an art which would have been learned much more easily, and very much less unwillingly, had they been properly taught at school."

Because it is our firm belief that the best foundation for a scientific career is a study of the classics in their original languages we are gratified to know that opinion at Cambridge University is turning towards retaining Latin as a compulsory subject for matriculation. The scientists on the Council of King's College supported that opinion by voting unanimously in favour of it. The practical difficulty lies in the vast and ever growing mass of information that the undergraduate is supposed to acquire. There is not time for everything.

Dr. E. C. Bullard (records the *Cambridge University Reporter*) presented the other aspect of the same problem, claiming that "scientists coming up as graduates know far too much science." There is a tendency to specialise in schools in the belief that it is for the good of the future scientist that he shall have passed Higher Certificate before entering the University, and thus shorten his stay there. The truth is that the schools, while not neglecting science, should be engaged primarily in training minds and forming habits of thought; no doubt knowledge is and must be acquired in the process, but knowledge is a secondary consideration. The lowest form of education, it has been stated, is a knowledge of facts without their contexts.

To render one's meaning clear is manifestly the first literary requirement of the scientist, but much depends on the style in which a treatise is written. It is on record that a young Australian policeman, describing in his report why he had failed to arrest his man in a goods wagon of a moving train, recorded that "Appalling atmospheric conditions prevailed throughout the incident, as surplus coaldust whirled to a parallel, sufficient in density to reduce visibility in the goods wagon to a minimum. These elements are submitted as agents which succeeded in severely neutralising the achievement of my objective." We get his meaning; but the fog in the goods wagon is only paralleled by the verbal fog in which the affair was wrapped. But let not the chemist cast the first stone. Too often his efforts are almost as woolly.

NOTES AND COMMENTS

Lucky Dip

THE lively interest in what may be available as reparations from Germany, evidenced by the numerous requests for information The Chemical Age has received since publishing preliminary details from the Foreign Office of scheduled German equipment, will derive fresh stimulus from the provisional list (pp. 667-9 this issue) of chemical plants earmarked by the British and American Commanders for distribution from their two zones. The chief merit of the present summary is the inclusion of brief descriptions of the character of the plant, as well as the names and locations, and names of the British Government departments which may arrange their disposal. *May* is in this connection the operative word. The schedule published fully in the *Board of Trade Journal* is a record of all the remaining plants to be made avilable from the two zones, with the exception of certain non-ferrous metal undertakings, the important synthetic oil, rubber, and ammonia plants, ball and roller bearing and shipbuilding industries. Thirty-nine items are scheduled as chemical plants or parts of them and, having regard to the qualifying statement in the preamble that the United Kingdom share will represent one-fifth of the total value of all equipment, it is evident that the increment to this country's chemical potential will not be hard to absorb. Even making an optimistic allowance for our share of the fundamentally important synthetic plants and non-ferrous metal undertakings not yet scheduled, the gap between what we are to receive and what was taken from us "by enemy action" will not be bridged.

Peaceful Infiltration

FIRST indications are now discernible of what is likely to be the course of events in the self-governing Dominion of India now that this country has relinquished its traditional rôle there. Many factors, however, continue to represent the quantity x in the equation, notably the question who is to provide the executive functions in the field of chemistry and science at large. The answer of an Indian nationalist—Indians—is unlikely to be wholly correct, notwithstanding the eminence in academic affairs of some distinguished Indian scientists. Some light is shed on a possible trend of events by an announcement in the American *Chemical and Engineering News* from its correspondent in Bombay seeking names of highly qualified American chemists and chemical engineers who may be interested to fill the position of director of an industrial research institute "to make the Indian chemical industry more research conscious." The successful candidate, who, incidentally, will be interviewed in the U.S.A., will be offered an attractive salary and a five-year contract. Applicants were asked to see that details were in the hands of the correspondent before December 31.

£12 Million More for Coal

BECAUSE chemical production depends more intimately upon coal than does almost any other industry recent developments in the long drawn out story of coal raising and distribution are of fundamental importance. Necessarily commanding most attention is the notification by the National Coal Board that negotiations with the National Union of Mineworkers "have been brought to a successful conclusion." The success seems to have belonged entirely to the N.U.M., whose 600,000 and more members will now receive 15s. a week more on weekly wage rates if they are underground workers and 10s. if they are surface workers. The consequent addition to the mining wages bill is estimated to run to £12 million or £13 million a year. That serious addition to industry's basic costs could easily be reimbursed by even a moderate heightening of effort in the coalfields, of which in the past few weeks there has been some evidence. In the nationalised industry, however, there are unfortunately no grounds of any kind for assuming the *quid pro quo* principle is to be observed; the weight of evidence, in fact, is otherwise. Presumably to discourage any wishful thinking along those lines the spokesman of the N.U.M. has summed up: The country's "minimum" needs (200 million tons) may or may not be mined this year, but there will be sufficient coal to keep unemployment at bay. This would appear to be a classic example of "the minimum target."

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40,000 More Miners

HAPPILY, gloom does not characterise the entire picture of coal prospects. The announcement that the mining force is to be reinforced in the next 12 months by 40,000 foreign workers—30,000 European volunteer workers and 10,000 German orphans as trainees—helps to offset the failure to raise the total of English miners to 730,000 by the end of the year. Extraordinary as the expedient appears, considering that the total sought in vain is 36,000 fewer than the 1939 total, the ultimate outcome must be a proportional betterment at least in future coal supplies. Equally encouraging is the more realistic policy foreshadowed by the Minister of Fuel's endorsement of most of the recommendations on fuel utilisation by the Parliamentary and Scientific Committee, and in particular of the principle of allocating coal on a "national priority" basis and of rewarding, instead of penalising, those undertakings which practise fuel economy most successfully.

The custom of basing allocations on what was used a year before has produced some absurd anomalies.

NEW COAL SEAMS

DEEP boring operations during the past six months by the National Coal Board on land adjoining the Whitegate factory, Wrexham, which aim at securing information about the underground strata, have revealed coal seams at the depth at which they were anticipated. A depth of 3000 ft. has been reached by the boring apparatus which is the first of its type to be seen in this country. It is a rotary mud flush drilling machine similar to those used for drilling oil wells in America. This present work is exploratory only, and other holes may be drilled. It is emphasised by N.C.B. officials that there is no intention of opening a new colliery at Whitegate, but if geological research is satisfactory existing mines in the Wrexham area may be extended. Sixty members of the Manchester Geological and Mining Society visited the site on November 14, when a paper was read by Mr. R. Foster, area planning engineer.

NON-FERROUS METALS

CONSUMPTION figures for non-ferrous metals in the U.K., issued by the Ministry of Supply in respect of the third quarter of 1947 (in long tons of virgin metal) are as follows: zinc 54,545; lead 44,650; tin 6346; cadmium 129; and antimony 1545.

A breakdown of these figures, to which scrap metals have been added (zinc 23,434, lead 38,320, and tin 1800) reveals that 26,275 long tons of zinc were used in brass production, 24,732 tons of lead in the manufacture of cables, 3178 tons of tin for alloys (whitemetal, bronze, gunmetal, etc.), 54 tons of cadmium for plating, and 917 tons of antimony for oxides and compounds. A comparison of consumption is as follows:—

	First Quarter 1947	Second Quarter 1947	Third Quarter 1947
Zinc	48,701	57,946	54,545
Lead	42,535	40,237	44,650
Tin	6663	6857	6346
Cadmium	122	130	129
Antimony .. .	1160	1317	1545

Prevention of Frothing

Patent Procedure for Mixed Fertilisers

IN any method of solubilising natural phosphates with nitric acid there is always the problem of frothing with which to contend. Engineering patent application No. 36109/1946, filed by the Office Nat. Industriel de l'Azote, of 35 Rue Emile Barrière, Toulouse, must therefore claim attention, for it relates to a method whereby this difficulty may be avoided.

Precalcination, as used in the Odda Smeltwerke process, is described as unsatisfactory. The new method, which is said to be simple, inexpensive, and to require but little extra power (1-2 kWh/ton), is as follows :—

Into a vessel or vat fitted with stirrer is introduced a suitably proportioned mixture of natural phosphate and nitric acid, together with a quantity of solution from a previous operation (or, if first starting, tapped from the bottom of vat). By thorough stirring, reaction takes place in such a manner that the whole is converted into a light fluid emulsion which is transferred to a perforated vessel revolving at high speed. The emulsion is thereby practically freed from froth.

An important requirement is that the natural phosphate (the portion of liquid previously treated or tapped from the bottom) must be suitably introduced. and recycled through a nozzle from which the phosphate is led into the reacting mass. The frothless material thus obtained may be further treated by known methods, *e.g.*, directly with ammonia. It is also possible to separate a portion of the calcium nitrate by cooling, and then to neutralise it with ammonia or lime.

Example: 1000 kg. natural phosphate is treated with 1700 lit. of nitric acid, and 10 cu. m. of solution from a previous operation is re-cycled at the same time. A sample taken from the outflow is a completely emulsified liquid. After passing through a high-capacity centrifuge there is only about 5-10 per cent of original froth remaining, and this is re-absorbed in subsequent working.

Tax on Advertising. — Announcing the supplementary Budget, the Chancellor of the Exchequer stated: At present expenditure on advertisements was allowed as an expense against business profits, both from Income Tax under Schedule D and Profits Tax . . . for the future only one-half instead of the whole of advertisement expenditure would rank as an allowable expense. There would be certain exemptions from that provision, including advertisements for the export trade, which stood obviously on a special footing, and advertisements in trade and technical journals.

World Petroleum Prospects

Attempts to replace Current Deficiencies

THE extent to which petroleum from many world sources of supply has diminished from the wartime and pre-war levels is reflected by current new reports from various quarters, some of which, however, give evidence of the determined efforts being made to increase drilling and refining.

Dutch Borneo.—Production of oil in the Balik Papan field of Southern Borneo, is reported now to have reached about half the pre-war level and further substantial progress is anticipated. The Soengei Geron refinery of the Standard Vacuum was reopened last month, initial throughput being 20,000 barrels a day. Pre-war capacity of 48,000 barrels daily may be reached soon.

* * *

Canada.—Crude oil output reached a new low level in the first six months of this year with 3,587,000 barrels as compared with 3,870,000 barrels last year. Production from the Turner Valley field dropped from 3,308,000 to 2,814,000 barrels, but Alberta production rose from 562,000 to 778,000 barrels. Production of natural gas totalled 29,385,000 cu. ft., compared with 26,799,000.

* * *

Japan.—Refined oil products in Japan amounted to 1,714,000 barrels in 1945 and 1,622,000 barrels in 1946. The war-time record figure was reached in the fiscal year to the end of March, 1943, when output aggregated 16,647,000 barrels.

* * *

Norway.—It is reported that the petroleum refinery recently constructed near Bergen, Norway, to replace a war-damaged plant, has started operations.

* * *

Italy.—The Macmillan Petroleum Corporation of Los Angeles intends to start drilling in Sicily next spring. The area involved exceeds 70,000 acres. An extensive search is being carried out in Northern Italy

* * *

Rumania.—Rumania's petroleum production of 4.26 million tons in 1946 ranks ninth of all oil-producing countries. In 1937 the production amounted to 7.15 million tons; in 1944 war damage reduced it to 3.53 million tons. In the new economic programme the monthly production is to be raised to 425,000 tons. More than half of the Rumanian petroleum exports (2,271,000 tons) last year went to Russia.

Luminescent Pigments.—The matter summarised in "Luminescent Pigments" (THE CHEMICAL AGE, November 1) was derived from BIOS Final Report No. 1455, of which the author was Mr. G. E. Hillier, of J. W. and T. A. Smith, Ltd., Maryland Road, Stratford, London, E.15.

GERMAN REPARATIONS

Thirty-Nine Chemical Plants Officially Listed

FULLER information than has hitherto been available relating to German industrial equipment for distribution as reparations is supplied in the current issue (November 15) of the *Board of Trade Journal*. In a section occupying ten pages are classified lists of plants which have been notified by the British and U.S. Commanders as being available for allocation. The data now available include brief descriptions of the actual plant, or as is usually the case in chemical installations, sections of plant which is to be released, as well as the name, location, file serial letters and number, and the Government department in London through which applications for allocations must be made.

39 Chemical Plants

Listed now are 39 chemical plants, 10 non-ferrous metal plants, 89 steel plants, 211 engineering plants and 83 war plants, those especially adapted to the manufacture of aircraft, guns, tanks, ammunition, etc. Numbers of installations for the production of chemical and allied equipment, pipelines, tank work, boilers, circulating systems, compressors, conveyors, etc., are named in the engineering sections.

The official notification is qualified by the warning that it is possible that substitutions may be made in some cases, in which event an early announcement will be made. Otherwise, the list is a record as announced in Berlin of all the remaining plants to be made available from the two zones with the exception of plants in the aluminium, beryllium, vanadium, magnesium, synthetic oil and rubber, synthetic ammonia, and ball and roller bearing, and shipbuilding industries, which will be the subject of further announcements at a later date.

One-Fifth for U.K.

It is hoped (adds the Board of Trade statement) that the allocation of these plants will commence during the early part of 1948, and that they will be disposed of to nations by the autumn of that year. The share of the United Kingdom in the plants represents approximately one-fifth of their total value. It is impossible to say, in advance of allocation, whether any particular plant will ultimately be allocated to the U.K.

In the winter of 1945/1946, representatives of U.K. industry visited plants in Germany for the purpose of assessing and advising production departments of their respective requirements of reparations plant. Such assessments will in many cases no longer represent industry's present needs, and in general will not serve as a guide for the compilation and entry of bids by the U.K. in respect of plants on the present list.

While full details of the equipment contained in these plants are not yet available, anyone who would be interested in securing any of the plants as a whole, or major portions thereof, is invited to express his interest in writing forthwith to the appropriate production department indicated in the schedule. A further announcement will be issued giving the final date for the submission of such expressions of interest.

Inspections

When full and up-to-date particulars are available expressions of interest may be confirmed or corrected. In certain cases, it will be possible for visits of inspection to be made prior to such confirmation or correction.

Each communication of an expression of interest should indicate very briefly the purpose for which the plant is needed and its relationship to the present production and capacity of the applicant. Inquiries for individual items of machinery and equipment located in the plants are not required at present.

Plant allocated to the U.K. will be offered for sale to ultimate users only through Government disposal channels. It will be sold at prices roughly equivalent to those ruling in the U.K. for corresponding equipment in the same second-hand condition.

Official Schedule

LISTED as " Industrial plants surplus to the bi-zonal level of industry, British Zone (North Rhine-Westphalia) " are plants or parts of plants of 17 undertakings, in the abbreviated descriptions of which, given below, a serial number (B/S/—) is quoted after the region and the administrating department is represented by the initials B.O.T. (Board of Trade, Raw Materials Division (5A), I.C. House, Millbank, London, S.W.1) or M.S. (Ministry of Supply (G5E), The Adelphi, London, W.C.2:—

North Rhine-Westphalia

A.G. FUR STICKSTOFFDUNGER, Knapsack (B/S/125): (*a*) section for the production of activated carbon (B.O.T.); (*b*) part of the section for the production of acetone from acetic acid (B.O.T.).

BLUMBERG & Co., Lintorf (B/S/126): plant for the production of pyrotechnics (M.S.).

DYNAMIT A.G., Schlebusch (B/S/127): (*a*) section for the distillation of glycerine (M.S.); (*b*) part of the section for the production of trinitrotoluene (M.S.).

DYNAMIT A.G., Troisdorf (B/S/128): (*a*) section for the production of nitropenta (B.O.T.); (*b*) section for the production of Vulcan fibre (B.O.T.); (*c*) part of the section for the production of phenoplasts (B.O.T.); (*d*) part of the section for the production of celluloid (B.O.T.).

Henkel & Cie. G.m.b.H., Dusseldorf (B/S/129): (*a*) part of the section for the production of soap powder (Ministry of Food, Scientific Advisor's Division, Portman Court, London, W.1); (*b*) part of the section for the distillation of glycerine (M.S.).

I.G. Farbenindustrie A.G., Dormagen (B/S/130): section for the production of Perlon U. (B.O.T.).

I.G. Farbenindustrie A.G., Elberfeld (B/S/131); (*a*) section for the production of cellulose derivatives (B.O.T.); (*b*) section for the production of miscellaneous resins (B.O.T.).

I.G. Farbenindustrie A.G., Holten (B/S/132): plant for the production of ethylene oxide and ethylene dichloride (B.O.T.).

I.G. Farbenindustrie A.G., Leverkusen (B/S/133): (*a*) section for the production of "Sulfigran" (sodium sulphide by hydrogen reduction of sodium sulphate), (B.O.T.); (*b*) section for the production of atebrin (M.S.); (*c*) section for the production of polyamides and miscellaneous resins (B.O.T.); (*d*) section for the production of hydrazine hydrate (M.S.); (*e*) part of the section for the production of activated carbon (B.O.T.); (*f*) part of the section for the nitration of toluene (M.S.).

I.G. Farbenindustrie A.G., Verdingen (B/S/134): part of the section for the production of alkydal resins (B.O.T.).

I.G. Farbenindustrie A.G., Zweckel (B/S/135): plant for the production of ethylene oxide, ethylene dichloride, polyethylene, bleaching powder (B.O.T.).

I.G. Sauerstoffwerk, Duisburg (B/S/136): plant for the production of liquid oxygen and bottled industrial oxygen (B.O.T.).

Kabelwerk Duisburg Abteilung Zunderfabrik, Mulheim (B/S/137): plant for the production of fuzes and detonators (M.S.).

Oxo-gesellschaft m.b.H., Oberhausen (B/S/138): plant for the production of higher aliphatic alcohols (B.O.T.).

Pyrotechnische Laboratorium W. Norres., Dorsten (B/S/140): plant for the production of pyrotechnics (B.O.T.).

Vereinigte Zunder and Kabelwerke, Lage/Lippe (B/S/142): Plant for the production of fuzes (M.S.).

Wecke, Ferd., Nachf., Wuppertal (B/S/143): plant for the production of pyrotechnics (B.O.T.).

Bavaria

Anorgana, Gendorf (A/S/67): (*a*) part of section for production of chlorine and caustic soda (Na_2O), (B.O.T.); (*b*) section for production of acetaldehyde (B.O.T.); (*c*) part of section for production of glycol (B.O.T.);.

Dr. Alexander Wacker, Burghausen (A/S/68): (*a*) part of section for production of plastics on basis of cellulose acetate (B.O.T.); (*b*) part of section for production of solvents (B.O.T.).

I. G. Farben, Gersthofen (A/S/69): part of section for production of wax (B.O.T.).

Kopp & Co., Munich (A/S/70): plant for production of soap products (Ministry of Food, Scientific Advisor's Division, Portman Court, London, W.1).

Chem. Werke V. Transche & Co., Gersthofen (A/S/71): plant for production of hydrazine hydrate (M.S.).

Vereinigte Flusspatwerke, Stulln (A/S/72): (*a*) section for production of hydrofluoric acid (B.O.T.); (*b*) section for production of sodium fluoride (B.O.T.); (*c*) section for production of synthetic cryolite (B.O.T.); (*d*) section for production of potassium bifluoride (B.O.T.); (*e*) section for production of sodium fluoro silicate (B.O.T.).

Electrochemische Werke, Munich (A/S/73): section for production of concentrated hydrogen peroxide (M.S.).

Hesse

Kalle & Co., A.G., Wiesbaden (A/S/120): part of the section for the production of methyl, ethyl, cellulose type products (B.O.T.).

Chem. Werke Kurt Albert, Wiesbaden (A/S/121): (*a*) part of the section for the production of phenoplasts (moulding powder), (B.O.T.); (*b*) part of the section for the production of artificial copals (B.O.T.).

M. Kappus, Offenbach (A/S/122): plant for the production of soap products (Ministry of Food, Scientific Adviser's Division, Portman Court, London, W.1).

I. G. Farben Hoechst, Hoechst (A/S/123): (*a*) part of the section for the production of uresin (B.O.T.); (*b*) part of the section for the production of polyvinyl acetate (B.O T.); (*c*) section for the production of carboresin (B.O.T.); (*d*) section for the production of sulphur black (B.O.T.); (*e*) part of the section for the production of solvents (B.O.T.); (*f*) part of the section for the production of chlorinated solvents (B.O.T.); (*g*) part of the section for the production of dinitrobenzene (B.O.T.).

P. S. Mobs, Giessen/Lahn (A/S/124): two plants for the production of soap products (Ministry of Food, Scientific Adviser's Division, Portman Court, London, W.1).

Roehm & Haas, Darmstadt (A/S/125): section for the production of soap powder (Ministry of Food, Scientific Adviser's Division, Portman Court, London, W.1).

I. G. Farben Sauerstoffwerke Griesheim, Griesheim (A/S/126): plant for the production of industrial gases (B.O.T.).

I. G. Farben Sauerstoffwerke, Kassel-Mittelfeld (A/S/127): plant for the production of industrial gases (B.O.T.).

Wurttemburg-Baden

Deutsche Pyrotechnics Fabrik, Cleeborn (A/S/150) plant for the production of pyrotechnics (B.O.T.).

Kraemer & Flemmer, Heilbronn (A/S/151): plant for the production of soap products (Ministry of Food, Scientific Adviser's Division, Portman Court, London, W.1).

Saline Ludwigshall, Bad Wimpfen (A/S/152): (*a*) plant for the production of sodium fluoride (B.O.T.); (*b*) plant for the production of aluminium fluoride (B.O.T.); (*c*) plant for the production of synthetic cryolite (M.S.).

Chemical Equipment

In a list of fifteen mechanical engineering undertakings in Hansestadt Hamburg are Barthels and Lueders, Hamburg, B/S/479; plant for the production of chemical equipment, boilers, tankwork and pipelines (M.S.); and Geb Boehling, Hamburg, B/S/480; plant for the production of boilers, tankwork and pipelines, organic and inorganic chemical equipment, equipment for gas and water industry and heat exchange apparatus. Included in the heavy and light engineering plants for disposal in Wurttemburg-Baden are Mahler, Esslingen, A/S/158; plant for the production of chemical equipment (M.S.); and Kodak A.G, Einsingen, A/S/176; plant for the production of phototechnics.

Oil-Crushing in France

In *Oleagineux* for July 1947, Edouard Rastoin discusses the present position and future prospects of the French oil crushing industry. In 1938 1,328,000 tons of oilseeds and nuts were processed; in 1944, 80,000; in 1946, 420,000, while the present annual capacity is about 700,000 tons. In two or three years this total is expected to be doubled. Under prevailing conditions extraction methods are found to give higher yields than pressing, though pressing will still be used for certain seeds; development work is proceeding, and new products from oils and fats are being rapidly introduced. The main problem is supply of raw material, for which great hopes are entertained from the new enterprises in French Africa.

The author notes the not always acceptable tendency for countries producing oilseeds, nuts, and fruit to develop their own oil-crushing industries, and to export the oil often at excessive prices.

French Dismantlings in Germany

56 I.G. Farbenindustrie Plants to Go

THE French Military Government has now drawn up the list of industrial plants to be dismantled in the French zone of Germany. The list contains 79 chemical plants which belong either directly or indirectly to the war industry or to industries whose production capacity is to be limited.

While the full list is not yet available, it has been officially stated that the dismantling programme includes 38 plants at the Ludwigshafen works of I.G. Farben industrie, nine of its plants at Oppau, eight at Rheinfelden, and one at Rottwell. The French dismantling list further mentions the aluminium works at Rheinfelden, the factory of Deutsche Gold- und Silberscheideanstalt at Rheinfelden, the Otavi mine at Blumberg, the Dynamit A.G. works at Hamm, and the factory of Duerener Leichtmetallwerke at Berlin-Wittenau. By far the most important of these works are the I.G. plants at Ludwigshafen and Oppau.

The German critics of the Anglo-U.S. dismantling list for the chemical industry admit that the production capacity as a whole is not severely reduced by the loss of the plants scheduled for dismantling. Their argument so far has been that certain sections of the chemical industry will have to bear the brunt of the dismantling programme and that these include some which are very important in present conditions.

1936 Level for Plastics

It is asserted that the production of plastics will be reduced to the level of 1936, when the industry was still very young and small. Removal of solvents factories will make it impossible for Germany to produce appreciable quantities of lacquers, and it is further claimed that the output of pest control agents and fertilisers will fall below local requirements if ammonia plants are dismantled according to the published list.

The main criticism, however, is directed against the proposed dismantling of plant for the manufacture of detergents. Of the present capacity in the Anglo-U.S. zone, which is given as 406,000 metric tons annually, 212,000 tons only are said to be available, and of this plant totalling 140,000 150,000 tons is to be dismantled.

"Oxo" Plant Dismantled

The remaining plant, it is argued, would in any case be far from adequate, but it could not in practice be used fully because of transport difficulties. Concern is also expressed about the dismantling of the "Oxo" plant at Holten near Oberhausen which draws on the light diesel oil from Fischer-Tropsch synthesis plants for the manufacture of soap. As this plant was recently scheduled for re-opening, it is hoped that its inclusion in the dismantling list may be rescinded.

In this connection the information has been volunteered that detergents were previously made from Fischer-Tropsch synthetic fatty acid products by two different processes: the Mersol process developed by Badische Anilin- und Sodafabrik, and the paraffin oxidation process developed by Henkel, Maerkische Seifenindustrie and I.G. Farbenindustrie.

The latter group, handicapped by shortage of coke, has had recourse to a third process, the Oxo process of Dr. Otto Roelen, by means of which 10,000 tons of products can be obtained in the plant at Holten. The light diesel oil fraction of the Fischer-Tropsch synthesis, which is used for this process but cannot be used for the other processes, accounts for about 18 per cent of the total output of liquid products in Fischer-Tropsch plants. It is claimed that use of the Holten plant would permit distribution of the full hard soap ration in the Anglo-U.S. zone without additional supply of coke.

£20 MILLION REFINERY EXTENSION

MINISTERIAL approval has been secured for the £20 million scheme for an extension of the Agwi Petroleum Corporation's refinery at Fawley, Southampton Water. The decision, says a Government letter to the Corporation, conforms to the national interest. The effect of the scheme will be to increase the refinery's present crude-oil capacity from 600,000 tons a year to more than 3,000,000 tons, involving a rise in the labour force from 1000 to 3000, and thus making the refinery one of the largest in Europe.

LINSEED OIL PROSPECTS

ADDRESSING the Export Group of the Paint Industry in London last week, Mr. A. G. Bottomley, Secretary for Overseas Trade, said that stocks of linseed oil were considerable, and the cultivation of linseed in Britain was expected to produce appreciable results before the end of next year. He added that it could be assumed that the present allocation of linseed oil and other paint industry raw materials, would continue on the present scale.

Lacquer bases and thinners are no longer being imported; there will be increased imports of solvents.

MODERN METHODS OF TAR DISTILLATION

RECENT progress in the technology of tar distillation was reviewed in some detail at the last meeting in Manchester of the North-Western branch of the Institution of Chemical Engineers by Mr. A. L. Curtis, whose study of the subject was derived from the tar distillation plant operated by the Koppers Company.

In the Koppers installation the tar is heated to 160° C. in a coil, is dehydrated in a distillation column which also separates the most volatile constituents, and is re-heated to 360° C. before entering the pitch column from which the vapour passes in series through five columns. A portion of the oil leaving each column is returned to the previous column as reflux and the temperature at the top of each column is automatically controlled by the control of the reflux.

The process is a continuous one and superheated steam is available in any column for additional stripping. Other automatic controls contribute to the successful operation of the plant. The heat consumption is low, 1,100,000 B.Th.U. per ton of crude tar and a heat balance on the distillation is given.

The pitch is blended with oils to produce a road tar by pumping both materials simultaneously into one pipe-line. The present output is 250 tons per day and the plant capacity is 400 tons per day of tar.

Control by Analysis

The analysis of oils for naphthalene content contributes much to the control of naphthalene production. Crystallising point curves are given for naphthalene recovery from oils at different temperatures and new curves are given for a special oil and naphthalene mixture.

Good fractionating equipment is necessary to increase the naphthalene content of oils from which naphthalene is extracted. The yield of hot-pressed naphthalene from the naphthalene oil fraction has been expressed as a table. The naphthalene oil fraction is continuously solidified by means of chilling drum and the solid hot-pressed. The naphthalene is bagged one hour after the naphthalene oil enters the chilling drum.

Anthracene is obtained from the anthracene oil fraction by crystallisation in horizontal cylindrical crystallisation tanks, followed by centrifugal separation. The oil is kept well stirred and can be pumped long distances by centrifugal pumps. A reaction between anthracene and maleic anhydride is used as a means of estimating anthracene in oils in two hours. Other constituents of coal tar can be isolated in small efficient stills. The plant is well housed and particular care is paid to cleanliness.

Mr. Curtis gave further details of the plant and products of interest from the engineering viewpoint in the course of subsequent discussion. The pipe still, he said, was made of boiler tube with ends of enamelled cast steel to guard against erosion. The pumps on the distillation plant had cast iron bodies and nickel alloy impellers. Carbon was deposited in the deposition tank and was thus avoided in the pitch cooler. The naphthalene cooler was cooled by water and small crystals of naphthalene were formed, making it necessary to apply the pressure on the hot presses slowly. The phenol was separated from the cresols which occur in the naphthalene fraction. The steam consumption of the plant was 90 lb. per ton of tar.

The branch paid a silent tribute to the memory of the late Lieut-Col. E. Briggs, C.B.E., D.S.O., a former vice-chairman of the branch.

AUSTRALIAN LEAD AND ZINC

AUSTRALIAN mining companies have predicted that prices for lead and zinc will rise and remain high for some time to come. Shareholders of Broken Hill South, Ltd., have been told that world demand for lead continues to exceed supply and that this position will continue. Prices outside Australia are rising, and at the annual meeting of North Broken Hill, Ltd., which took place recently, Mr. Maurice Baillieu, chairman, said that world prices for lead are dominated by demand in the United States, which is not only the largest producer of lead but is also a big importer, and is likely to continue importing large quantities. Mr. Baillieu pointed out that Britain is buying more lead than she did before the war and he predicted that income from North Broken Hill, Ltd., would increase.

U.S. ALUMINIUM PRODUCTION

PRODUCTION of virgin aluminium in the U.S.A. in July was 47,998 short tons compared with 46,259 in the previous month, while stocks of primary aluminium rose from 73,893 short tons at the beginning of July to 78,054 at the close. The major source of raw material was Canada which supplied 603 short tons in July making a total of 14,553 short tons for the January/July period. Main U.S. customers for alloy ingot and slab, etc., during the seven-month period were the South American countries which secured 364 short tons of the 842 exported. In July, 2168 short tons of sheets, plates and strips were exported to Asiatic destinations, by far the largest market, making 9917 tons for the seven-month period.

SEPARATING FINE PARTICLES

New Selective Method Described

SOME developments in the technique of separating particles by air or gas stream, relating in this instance to aluminium or other powders of leaf or needleform structure are represented by the British patent application No. 26487/1947 in the names of Carlsfors A/B and K. G. Winquist, of Carlfors, Huskvarna, Sweden.

The patent does not disclose the actual method used in production of the aluminium or other powder, but is mainly concerned with methods of separation or classification of the powder by centrifugal air blast according to specific surface of particles.

Aluminium powder in light or porous concrete promotes evolution of hydrogen gas, or "fermentation," and the chief difficulty is to correlate the end of fermentation period with the beginning of hardening. The period of gas evolution depends large on particle size of the flakes, hitherto mainly decided by sifting. Existing methods are not wholly satisfactory, as account is not taken both of weight and extent of surface area. Fermentation time has been found to be inversely proportional to specific surface of grains or flakes, *i.e.*, ratio of area to weight. At the same time, the size of flakes must not fall below a certain minimum, otherwise pores in the concrete would be too small.

Gas Stream

The main purpose of the present invention is to divide the material into suitable fractions, according to the specific surface of particles and their weight, by use of centrifugal wind separation. Suitable apparatus includes a fan into which unsifted powder is fed from the container, and the powder together with a gas stream (presumably carbon dioxide) is blown tangentially into an annular chamber where the heavier particles and those of small specific surface are separated by centrifugal force, thrown against the walls of chamber, thence through a funnel-shaped outlet into another container.

In helical or spiral paths the gas stream with particles of large specific surface passes through a sifting device, the centre of which is connected with a pipe serving as an outlet for the gas stream mingled with sifted powder, and leading to a filter in which the gas is freed from floating particles, which fall through the bottom of the filter into the container below.

From the filter the purified gas stream passes through a pipe back to the fan. A conduit is connected at one end to the high-pressure side of the fan, and is provided with an adjustable valve leading direct to the annular chamber. Through this conduit additional gas is supplied to the chamber, thereby governing the tangential velocity of main gas stream. By adjusting this valve the sifting capacity of whole apparatus may be regulated.

Selective Separation

By this means not only are light particles separated from heavier ones, but those of small surface area are separated from larger ones. By fine regulation of the velocity or amount of air, respectively, in the two inlets of separator the desired fraction with respect to specific surface and optimum size can be obtained. The practical improvement thus achieved is illustrated by a curve where the fermentation period in minutes is plotted against hydrogen evolution in millilitres. By usual methods hitherto used 27 min. are required to reach a hydrogen evolution of 700 m/lit. By the new method only 12 minutes are needed. Moreover, the specific surface area in the second case is much greater per gramme, as necessarily is the ratio of weight to length: in the first case 1 : 37, and in the second 1 : 46.

With aluminium flake powders, the use of carbon dioxide as the inert gas eliminates or considerably reduces risk of explosion. The process is, of course, applicable to powders for other uses, including paint.

In view of the growing importance of particle size, shape, and distribution in many branches of modern industry, if the new method does all that is claimed, it should find wide application in powder technology generally. Pneumatic methods of separation are old and well known; this, however, appears to carry the technique a step further.

Caustic Soda in Brazil

The Brazilian Government has inaugurated the establishment of a National Caustic Soda Industry and has obtained a loan from the U.S. towards the cost of machinery and equipment—as well as for the payment of American experts for training Brazilian technicians in connection with the plant. The factory will be located at Cabo Frio in the State of Rio de Janeiro where the two essential raw materials, salt and lime, are found. The Federal Government will hold 54 per cent of the capital of the new company—the Cia. National de Alcalis—the remainder being subscribed by Brazilian investors.

In the Chilean Punta Arenas district oil-drilling operation at Springhill, Tierra del Fuego, has been satisfactorily completed, oil with a high petrol content having been discovered at 7400 feet.

IRON COMPOUNDS AND PHOSPHATIC FERTILISERS

TESTS WITH X-RAY POWDER DIAGRAMS

by H. W. LEHRECKE, Ph.D.

A SOLUTION was made of 100 parts of $FeCl_3.6H_2O$ in 400 parts of H_2O. This solution was added during vigorous stirring to a solution of 80 parts of diammonium phosphate in 400 parts of water. A light yellowish precipitate was formed which was washed by decantation until no chlorine was to be found in the filtrate. The precipitate was dried in a desiccator at ordinary temperature. (It is difficult to remove the last traces of free water from the precipitate.)

The product made in this way showed a weight ratio of P_2O_5 to Fe_2O_3 of 0.8877 against the theoretical 0.8876.

The X-ray powder-diagram of this compound, taken with Cr_{B-K}-radiation, did not show the slightest trace of interference (Fig. 2a). Thus the product must be regarded as really amorphous. No change in this condition could be observed during storing at normal temperature.

In order to study the influence of elevated temperature on the structure of ferric phosphate and its solubility, two samples were heated to a temperature of 75° C. during 35 and 50 days respectively. In the first case no change visible to the eye could be observed, but the X-ray powder-diagram (Fig. 2b) showed distinct reflections. This proved that crystallisation had begun.

The sample which had been heated during 50 days had gained a light whitish rose colour. From the X-ray powder-diagram (Fig. 2c) it can be seen that in this case the crystallisation had become still stronger than in the case of the 35-day sample.

The reflections in these two diagrams of the heated amorphous modification of ferric phosphate are identical with the reflections obtained from the directly precipitated crystalline form of this composition (Fig. 2d). In this case the reflections are more diffuse because of the very small size of the crystallites.

Simultaneously with the transformation of the amorphous form of ferric phosphate into the crystalline one by elevated temperature, a considerable decrease of its citrate-solubility had occurred. This solubility was determined with the so-called Petermann solution, an ammoniacal solution of citrate of ammonia (23 per cent, S.G. 1,081, $pH = 9.1$), at 20° C. and in accordance with the recognised procedure.

The solubility of a sample of amorphous ferric phosphate was found to be as high as 47.2 g. per 100 cc. of the above-named solution of citrate of ammonia. The solution obtained had a deep brown colour and turned after some days into a gel (probably $Fe(OH)_3$).

Only 8.0 g. of the sample of amorphous ferric phosphate which had been heated to 75° C. during 35 days and thereupon proved to be partly crystallised, were soluble per 100 cc. of Petermann's solution of citrate of ammonia. This solubility decreased still more, *i.e.*, to only 0.09 ferric phosphate per 100 cc., when the sample of amorphous ferric phosphate, which had been heated to 75° C. during 50 days and thereupon showed intensive crystallisation, was treated with Petermann's solution of citrate of ammonia.

Crystalline Ferric Phosphate

A solution was made of 72.15 g. $FeCl_3.6H_2O$ in 100 g. water and 29.42 g. phosphoric acid (89 per cent H_3PO_4) were added to the solution. This was evaporated until it became syrupy and diluted with water in a proportion of 1 : 1. A light rose-coloured precipitate was formed during the dilution, filtered off, washed with water and dried at 40° C.

The product obtained showed the following composition:—

	Found	Theoretical
P_2O_5	37.97%	37.97%
Fe_2O_3	42.72%	42.78%
Proportion $P_2O_5 : Fe_2O_3$	0.8888	0.8870

The X-ray power diagram (Fig. 2d) shows the same interferences as the crystalline ferric phosphate, which was obtained by heating the amorphous modification (Fig. 2b and c), but the lines are more diffuse, resulting in the disappearance of the weakest ones. From this it must be concluded that the crystallites of the directly precipitated ferric phosphate are smaller than those obtained by the slow transformation of the amorphous modification to the crystalline form.

This is confirmed by the figures obtained for the solubility of the directly precipitated phosphate in Petermann's solution of citrate of ammonia. This was found to amount to 0.1463 g. per 100 cc. solution at 20° C. against 0.09 g. for the transformed amorphous modification. By the thermodynamical calculation of W. Ostwald[8] it has been shown that the solubility of a substance increases with decreasing size of its particles, if these become less than 10^{-4} cm.

However, the solubility of the crystalline ferric phosphate obtained directly as described is of the same low order as that of the crystalline form obtained by heating the amorphous modification.

For practical purposes it can therefore be stated that the crystalline forms of iron triphosphate are insoluble in an ammoniacal solution of citrate of ammonia.

Diphosphatoferric Acid

The following method was used in order to produce diphosphatoferric acid with 2.5 molecules of water:—

24 g. amorphous $FePO_4.2H_2O$ were dissolved at 75° C. in 100 g. phosphoric acid containing 48 per cent H_3PO_4. The solution was kept at 75° C. during several hours. A rose coloured crystalline precipitate was formed, which was filtered off, washed and dried. Its composition was as follows:—

	Found	Theoretical $H[Fe(PO_4)_2].2.5H_2O$
P_2O_5	48.63%	48.32%
Fe_2O_3	27.65%	27.17%
Proportion by weight		
P_2O_5 : Fe_2O_3	1.759	1.778

A certain excess of Fe and a still smaller one of P_2O_5 was present, probably caused by the action of the washing water on the film of mother liquor on the surface of the crystals. Because of its smallness, this surplus could be neglected during the following work.

The X-ray powder diagram of the diphosphatoferric acid produced in this way is shown in Fig. 2e. It consists of a great number of interferences, which proves a complicated crystal structure of the complex compound. The diagram is quite different from those obtained for crystalline $FePO_4$.

(Continued overleaf)

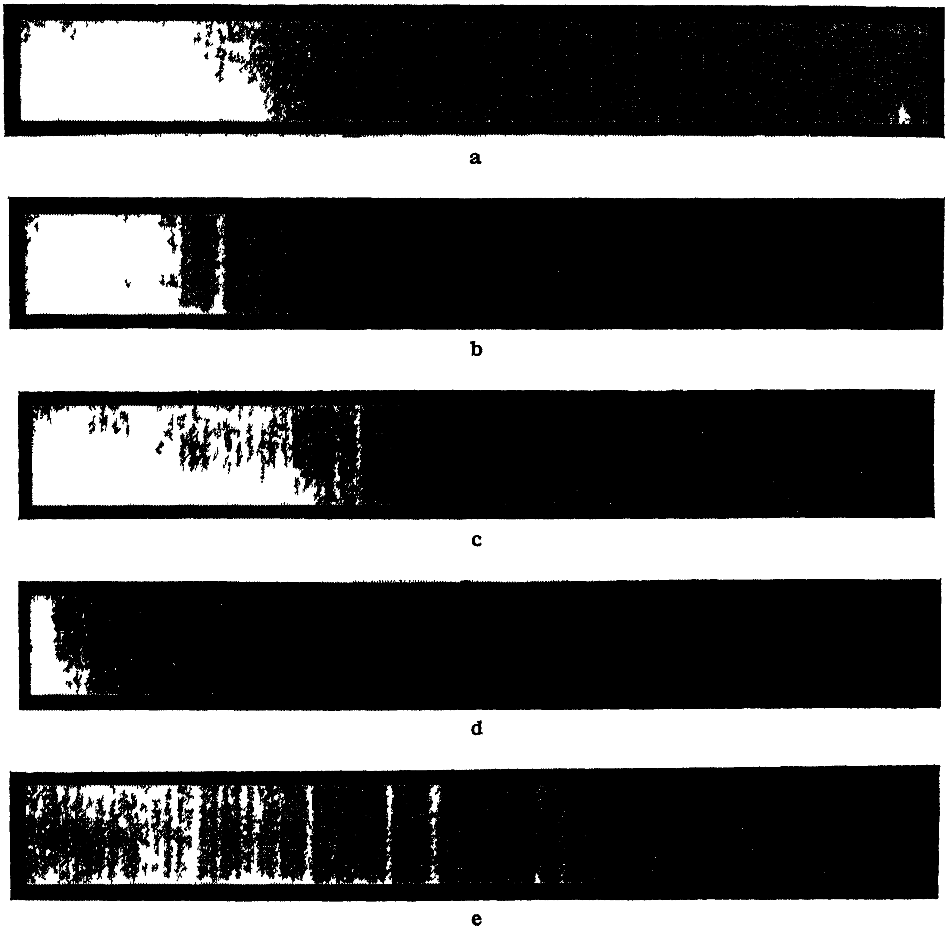


Fig. 2

NATIONAL FOUNDRY COLLEGE

THE National Foundry College, which will open its first session on January 5 at Wolverhampton, is the lineal successor, with widened scope, of the National Foundry College, which closed at the outbreak of war. Its board of governors, nominated by the Minister of Education, represents a number of interested bodies in industry and education under the chairmanship of Mr. Randall G. Hosking. The college will be housed in, and work closely in conjunction with, the Wolverhampton and Staffordshire Technical College.

The board is charged with providing national facilities for foundry education and research, in the form of full-time courses, vacation courses, refresher courses, and the like, and also for providing regional and local facilities for full-time, part-time day and evening courses, covering the whole range of foundry education. Its first task will be the re-establishment of the full-time diploma course which was the main feature of the British Foundry School, during 1935-1939

40-Week Course

This course will normally run for an academic year of 40 weeks from September to July. It will cover the whole of the foundry industry, ferrous and non-ferrous, including grey, white and chilled iron castings, malleable castings, steel castings, and castings in all non-ferrous metals, such as alloys of copper, tin, zinc, nickel, aluminium and magnesium. The diploma awarded to successful students will be endorsed by the Ministry of Education.

A minimum of one year's practical experience in at least one branch of the industry will be required of candidates, for whom there is no age limit, together with Higher National Certificate, or a university degree, preferably in metallurgy or engineering, or a grade of membership obtained by examination of a professional institution in engineering, metallurgy or chemistry. It is intended to invite nationally known experts in the industry to participate in the work of the college.

Principal Appointed

The Minister of Education, on the recommendation of the board of governors, has appointed Mr. J. Bamford, B.Sc., who was in charge of the British Foundry School during 1935-39, and who has since held important managerial appointments in the industry, to be the college principal.

The prospectus and the curriculum with form of application for admission can be obtained from the Head of the National Foundry College, Technical College, Wilfruna Street, Wolverhampton.

COST OF SHORTAGES

ADDRESSING the 18th ordinary general meeting of the Imperial Smelting Corporation, Ltd., in London last week, Mr. J. R. Govett, the chairman, revealed that last winter's fuel shortage caused a complete 3-week stoppage of lithopone manufacture at the Widnes works. An additional lithopone plant which the company had under construction, and had hoped to have ready for operation soon, had been delayed owing to lack of steel. Last year's production of lithopone, the distribution of which had been officially controlled, had been 75 per cent absorbed by the home paint trade, and the balance by other trades and export. As a result of improved efficiency in the operation of vertical retort plant, zinc production had exceeded that of 1946, while sulphuric acid production had been the highest ever.

IRON COMPOUNDS (*Continued from page 673*)

It thus appears that $FePO_4$ cannot be an iron salt of diphosphatoferric acid. The solubility of the diphosphatoferric acid in Petermann's solution of citrate of ammonia amounted to 7.272 g. per 100 cc. at 20°C. Consequently, it is considerably more soluble than the crystalline form of ferric phosphate.

Table 1 gives a summary of the solubilities in Petermann's solution of citrate of ammonia found for the compounds of iron and phosphoric acid investigated in this work.

TABLE 1.

Composition	Solubility in 100 cc. of Petermann's ammoniacal solution of citrate of ammonia at 20°C.
Amorphous ferric phosphate, $FePO_4$...	47.20 g.
Crystalline ferric phosphate, formed by crystallisation of amorphous $FePO_4$	0.09 g.
Crystalline ferric phosphate, directly precipitated	0.146 g.
Diphosphatoferric acid, $H_3[Fe(PO_4).2.5H_2O$	7.272 g.

From this it can be stated, that only amorphous $FePO_4$ and $H_3[Fe(PO_4)_2].2.5H_2O$ are soluble in a practical sense. The crystalline forms of $FePO_4$, however, must be considered as insoluble.

Furthermore, it must be concluded from these results that a decrease of the citrate-solubility of the phosphoric acid in superphosphate is a consequence of the transformation of diphosphatoferric acid into crystalline ferric phosphate.

REFERENCES

8. W. Ostwald, Zeitschr. Phys. Chem. **34**, 495 (1900)
9. See A. Bailer, *loc.cit.*
10. See Carter and Hartshorne, *loc.cit.* p.2230.
11. Sanfourche and Focet, Bull Soc. Chim., **53**, p.1517-22 (1933). Marshall and Hill, Ind. Eng. Chem., **32**, p.1227 (1940).

(*To be continued*)

American Chemical Notebook

From Our New York Correspondent

FOR developing with his associates the first commercially successful cracking process to make more gasoline out of crude oil and thereby becoming the father of modern petroleum refining technology, Dr. William M. Burton, of Cambridge, Massachusetts, retired former president of the Standard Oil Company (Indiana), of Chicago, was last week awarded the American Petroleum Institute Gold Medal for Distinguished Achievement. Patented January 7, 1913, following development in the laboratory at Indiana of Standard's Whiting, Indiana, refinery, the Burton process more than doubled the potential yield of gasoline available from crude oil to meet the vast demand for gasoline which the age of the automobile was to create. The award cited Burton's pioneer work in demonstrating the value of laboratory research and testing and describes him as "the progenitor of modern refining technology. You developed," the citation continued, "the first commercially successful cracking process, more than doubling the potential yield of gasoline available from crude oil. This process marked the industry's advance from merely separating and purifying the natural ingredients of petroleum to altering its chemical composition so as to produce tailor-made molecules for specific purposes" Previous honours awarded to Dr. Burton include the Willard Gibbs medal of the American Chemical Society in 1918, and the Perkin medal of the Society of Chemical Industry in 1922. The latter award is the highest recognition attainable in the United States for work on applied chemistry.

The U.S. chemical industry may succeed in bettering its highest wartime production, if the present output is maintained throughout the fourth quarter. Demand for chemicals continues to outstrip supply, and last year the industry produced nearly 35 million tons of organic and inorganic chemicals. This year's production of industrial chemicals has reached a level of 329 per cent above the 1935-39 average compared with the wartime peak of 312 per cent. Meanwhile, financial statements covering the first nine months of 1947 indicate that the industry is continuing to earn handsome profits. Future prospects are favourable since the United States has largely taken over the markets formerly supplied by the German chemical industry—it is estimated that U.S. chemical exports in 1947 may total $700 millions, an all-time record. The high volume of production can be largely explained by the fact that the industry has been investing large amounts of capital in new buildings and equipment. During the next two years huge amounts will be spent in this direction with Du Pont alone intending to spend $300 millions.

* * *

Professor Benjamin Harrow, chairman of the department of chemistry at the City College of New York, has been elected to the British Royal Society of Arts, it was announced by the college this week. He is the second faculty member of the college to have received the honour this year. The first was Prof. Albert P. d'Andrea, of the department of art.

Dr. W. Burton (left) and Dr. Robert E. Humpphreys, who were the guests of honour of the British Newcomen Society in Chicago last year, when the Standard Oil Co. catalytic cracking plant (in the photograph) was opened in Indiana

PARLIAMENTARY TOPICS

Imports of Scientific Books.—Owing to the large dollar expenditure involved it was necessary last September to revoke the Open General Licence for import of non-fiction books. Under the new arrangements licences are granted to pre-war importers of learned scientific and technical books in English to bring in up to 100 per cent by value of their pre-war imports. I am, however, prepared to consider the issue of licences for limited additional imports of technical and scientific books in English from certain European countries. Similar books in foreign languages from non-English speaking countries are licensed freely.—Mr. H. Wilson.

Copper Sulphate Sales.—Exports of copper sulphate, which have been running during the first nine months of this year at an annual rate equivalent to approximately 90 per cent by volume of pre-war exports, have been limited by the import restrictions in force in some of our principal markets. My Department will continue to take all practical steps to press the Governments concerned to relax those restrictions to enable the United Kingdom product to compete on equal terms with those of other suppliers. I am glad to be able to announce that, at the recent meeting of the Anglo-French Economic Committee, the French Government agreed to issue import licences for a substantial quantity of copper sulphate from this country. —Mr. H. Wilson.

Questionnaire to Scientists.—The questionnaire form which the Ministry of Labour despatched to about 160,000 British scientists on October 27 was undertaken at the request of the Advisory Council on Scientific Policy in order to obtain information about scientific manpower here. The paper involved weighed about 16 cwt. and the cost of printing was £88.—Mr. Isaacs.

Iron Ore Subsidies.—Recent subsidies to offset abnormal freight charges on iron ore since, April 1, 1946, to September 30, 1947, have been: Soft currency areas, £5,500,000 (5,750,000 tons); Sweden, £2,500,000 (3 million tons); Newfoundland, £1,700,000 (1,175,000 tons).—Mr. G. R. Strauss.

Creosote-Pitch Subsidy Withdrawn.—The maximum delivered price of creosote-pitch mixture was increased by 30s. per ton on October 1—an increase of 27.8 to 31.7 per cent—reflecting the increase on September 1 of 35s. per ton in the price of petroleum heavy fuel oil. The subsidy of 16s. 8d. per ton to creosote-pitch producers was withdrawn.—Mr. H. T. Gaitskell.

Seaweed Research.—Seaweed is being collected by crofters organised by the Scottish Seaweed Research Association, which is also arranging its sale; a private concern is also engaged in this work. Gathering has been in progress for the past three years, and research is continuing with a view to securing greater quantities.—Mr. Woodburn.

16,000 Whales.—The internationally agreed total of 16,000 blue whales which British whaling fleets may kill in the Antarctic during the current whaling season will not be exceeded. A catch of the size should not endanger future supplies, and experts had taken the view that the total should be raised, in view of the extreme shortage of oils and fats.—Mr. J. Strachey.

Imported Salt.—Imports of salt (from Spain) are necessary because the output of coarse salt in this country is not sufficient, particularly for fish curing and snow clearing.—Mr. H. Wilson.

THE DALTON BUDGET

THE Dalton Budget made no attempt to deal with wages, work, output and all those major issues now blazoned on the hoardings of the country in the form of threats, appeals and targets. That failure —writes Sir Ernest Benn—transcends in importance any of the alterations in the details of taxation.

For the moment the Stock Exchange is on the horns of a most difficult dilemma. Dr. Dalton's affection for cheap money which colours the whole of the Budget was an inflationary influence and put up the prices of industrial stocks and shares in spite of heavier taxation. The arrival of Sir Stafford Cripps with his preference for austerity and deflation—a much more healthy point of view—may very well result in a general fall in Stock Exchange values.

Still Bankrupt

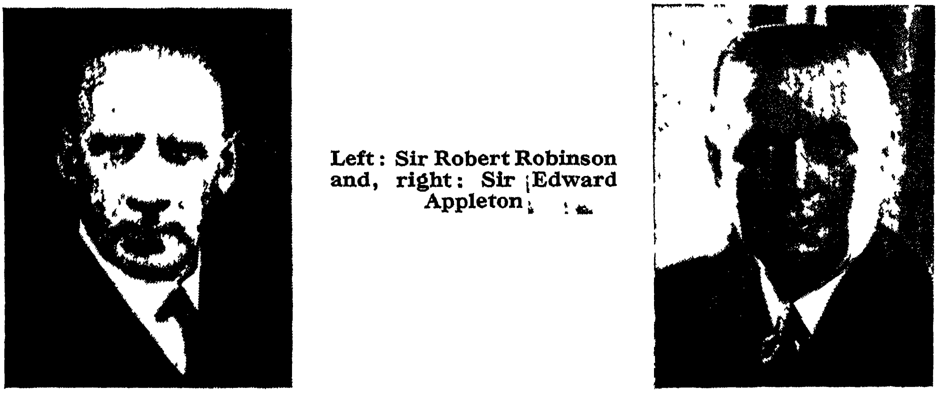
The Budget does nothing whatever towards helping to solve the difficulty of an adverse balance in our overseas payments. The reduction of a debit of £700,000,000 to half the figure still leaves us in the position of the bankrupt, an unhappy position for a buyer; while because no steps are taken to reduce our costs at home, we still suffer serious handicaps as a seller. In this connection the flat refusal to reduce Government expenditure, except in regard to the means of defence, gives grounds for the gravest apprehensions.

The Budget bears all over it the mark of the T.U.C. which is rapidly becoming the centre of power. Had Mr. Dalton plucked up the courage of a Joseph Chamberlain, who won considerable popularity by the bold, frank and perfectly truthful statement "Your food will cost you more," he would have served the true interests of the nation better.

International Awards for English Scientists

Two Nobel Prizes

FOR the first time in 43 years Nobel prizes in chemistry and physics were last week awarded simultaneously to English scientists. The recipients were Sir Robert Robinson, president of the Royal Society and Waynflete Professor of Chemistry, Oxford University, and Sir Edward Appleton, principal of the Department of Scientific and Industrial Research.



Left: Sir Robert Robinson and, right: Sir Edward Appleton

In addition to the signal honour represented by the international recognition of their pre-eminence in two fields of research, each receives the customary £8000 award from the foundation in Stockholm created by the late Sir Alfred Nobel.

Chemistry of Plant Life

The award to Sir Robert Robinson recognises his great contribution to fundamental research in organic chemistry, latterly with penicillins. Practically all his work for many years has been directly concerned with the biologically useful substances. An important sphere of his investigations was the identification of the chemical structure of complex compounds of vegetable origin and tracing the steps by which they were built up by natural processes. One of his more noteworthy studies has been of the formation in plants of alkaloids, such as morphine and strychnine and of their structure, in which his contributions are of fundamental value.

Among his many achievements in biochemistry was his synthesis with Prof. Dodds of silbesterol, which is an important factor in combating cancer of certain kinds. Equally fundamental were the results of much of his work in theoretical organic chemistry dealing with the electronic aspect of chemical combination.

The Nobel award comes as a fitting culmination of a series of honours by which Sir Robert's work has been recognised in the past few years. The Royal Society in 1942 gave him its highest award, the Copley Medal, and he is a former president of the Chemical Society. The series of honours bestowed upon him this year testify how widespread is the recognition of his achievement. They include: in March the Franklyn Medal, highest award of the American Franklyn Institute, for his investigations of pyrimidine analogues and their reaction to vitamin B; in May election as *correspondant* of the Chemistry Section of the Paris Academy of Sciences and as a member of the Royal Norwegian Academy of Sciences; in May the Albert Medal, highest award of the Royal Society of Arts " for outstanding contributions to the advancement of organic chemistry."

The " Appleton Layer "

Sir Edward Appleton, head of the D.S.I.R. since 1939, whose Nobel award recognises his contribution " in exploring the ionsphere—the electrically conductive strata in the upper atmosphere of the earth," has been foremost since the outset of his scientific career in pioneer studies of radio wave behaviour, and latterly in the associated subjects of solar radiation and radar. His investigations established the existence of electrified layers in the upper atmosphere, which were matters of conjecture, and in particular of the so-called " Appleton layer.' These layers of electrically charged particles play an essential part in making possible wireless communication between distant stations.

Rising Coal Output

Target May Be Reached

COAL output in the U.K. last week reached 4,258,200 tons, thus continuing the upward trend of recent weeks following the introduction of overtime in the mines. A statement has been circulated to the industry—it has been signed by Lord Hyndley, Coal Board chairman, and Mr. Bowman and Mr. Horner, N.U.M. officials—to the effect that only 27,700,000 tons are required to reach the Government's target of 200 millions. Workers are urged—" let us go flat out."

Miners' Wages Increase

At a meeting between the National Coal Board and the National Union of Mine workers last week-end—the Board had offered an additional 10s. per week in response to the Union's demand for 20s.—it was agreed that underground workers will be recommended to accept a weekly increase of 15s. per week, and surface workers 10s. per week. These increases, and related matters discussed and agreed were to be confirmed by the delegate conference of the Union, and the new rates are intended to take effect retrospectively from November 1.

ROCKET EXPLOSION

AN explosion occurred last week at a Ministry of Supply experimental station, Westcott, near Aylesbury, Bucks., where work is being undertaken in connection with rocket-assisted aircraft take-off. Three research workers—among whom was Dr. J. Schmidt, a leading German scientist—were killed, and eleven injured.

The incident, which is reported to have been caused by the discharge from one rocket prematurely exploding another, occurred despite the fullest observance of safety precautions. An official inquiry into the cause of the explosion opened on Monday last, and is expected to last a month.

QUININE PRODUCTION RECOVERY

REPORTS regarding the state of Batavian cinchona plantations and quinine salt output are reassuring. Ninety per cent of the Java plantations are in Dutch hands. There has been an abnormal increase in the annual production of cinchona, and quinine has been exported since the capitulation of Japan; the productive capacity of the area appears to be very considerable. The Bandoeng quinine factory has recommenced small-scale operations. Interested organisations have had consulations with the Batavian Government to determine the best methods of recapturing those markets that during the war had to take synthetic anti-malarials.

Next Week's Events

SATURDAY, NOVEMBER 22

Society of Chemical Industry and Royal Institute of Chemistry (South Wales Section). Britannic House, Llandarcy, near Swansea, 2.30 p.m. A discussion on " The Chemist in Industry " to be opened by R. B. Southall.

MONDAY, NOVEMBER 24

Royal Statistical Society (Sheffield Group). Room B1, Department of Mechanical Engineering, The University, St. George's Square, Sheffield, 1, 6.30 p.m. Mr. C. F. Turner : " Examinations Examined."

Institute of Fuel. Lecture Theatre, Radiant House, Bold Street, Liverpool, 2.30 p.m. Dr. A. C. Maries : " The Coal Resources of the Country."

TUESDAY, NOVEMBER 25

Society of Public Analysts (Physical Methods Group). Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 6.0 p.m. Annual General Meeting, 6.30 p.m. Mr. B. S Cooper : " The Electron Microscope."

Society of Instrument Technology. Royal Society of Tropical Medicine and Hygiene, Manson House, Portland Place, W.1, 7 p.m. D. Edmundson : " Electronic Developments in Instrumentation."

WEDNESDAY, NOVEMBER 26

Irish Chemical Association and the Royal Institute of Chemistry (Dublin Section). Chemical Department, University College, Dublin, 7.30 p.m. Dr. T. E. Nevin : " The Experimental Approach to the Problem of Nuclear Forces."

Society of Chemical Industry (Northern Ireland Section). Agriculture Lecture Theatre, Elmwood Avenue, Belfast, 7.30 p.m. Mr. H. W. Cremer : " Water—a National Asset." Food Group. Burlington House, Piccadilly, W.1, 6.15 p.m. J. M. Shewan and E. P. Sidaway : " Biological Stability of Processed Fish and Manufactured Fish Products."

Manchester Metallurgical Society. Engineers' Club, Manchester, 6.30 p.m. E. W. Colbeck : " Some Metallurgical Problems in the Field of Atomic Energy."

Institute of Welding. The Connaught Rooms, Great Queen Street, W.C.1, 12.30 p.m. Luncheon.

THURSDAY, NOVEMBER 27

Society of Dyers and Colourists (West Riding Section). Great Northern Victoria Hotel, Bradford, 7.15 p.m. Dr. P. Schulman : " Emulsions Oil and Water Dispersal Mediums."

Royal Institute of Chemistry (London and S.E. Counties Section). Public Library, William Street, Slough, 7.15 p.m. Dr. A. H. Lewis : " Some Aspects of Chemistry in Relation to Agriculture." Manchester and District Section. The Lecture Hall, Albert Hall, Peter Street, Manchester, 7 p.m. Dr. D T. A. Townend : " Chemistry and Fuel." (Fourth Dalton Lecture). Liverpool and N.W. Section. Liverpool, 7 p.m. Mr. G. A. Glister " Penicillin." East Midlands Section. Technical College, Shakespeare Street, Nottingham, 7.15 p.m. Dr. S J. Folley : " Biology of Lactation."

FRIDAY, NOVEMBER 28

Society of Chemical Industry (Newcastle Section). King's College, Newcastle-upon-Tyne, 6.30 p.m. Dr. H. H. Hodgson : " Studies in Diazo Chemistry with a Criticism of the Free Radicle Hypothesis."

British Association of Chemists (Scottish Section). St. Enoch Station Hotel, Glasgow, 7 p.m. Mr. N. Sheldon : " Economic Security in the Chemical Profession."

Technical Publications

THE ten years that have passed since Plant Protection, Ltd., came into existence have witnessed so many advances in scientific inquiry that those concerned with agriculture are apt to be overlooked. The war necessitated a complete overhaul of agricultural methods, fertilisers and insecticides in particular being subject to intensive research and development. Plant Protection, Ltd., can claim to have contributed much to that development, some aspects of which are touched on in the 20 pp. booklet "Science in the Service of Agriculture," which Plant Protection has just issued in attractive form decorated by a number of very pleasant engravings.

* * *

Full description and illustrations of the new laboratory apparatus which J. W. Towers and Co., Ltd., exhibited at the B.I.F., are now provided in the latest publication of "Towers Laboratory News." Among these are the new semi-micro balances, humidity cabinet, universal electric oven, vibro shaker, time switch and simmerstat units, the all-glass water still and Lablox support frames. Another link with the B.I.F. is provided by the electric heating mantles (THE CHEMICAL AGE October 25), the production of which was stimulated by many requests for the type of apparatus received at the Fair.

* * *

"Brass and Copper" is the title of a 250-pp. catalogue of Downs-Smith Company, New York, which derives an international value from the fact that it contains numerous tables of standards, specifications, weights, terminology, covering the physical properties, tolerances, and other requirements of copper and its alloys for sheets, rods and bars, wire, tubes, and tubing, hardware, and all industrial fittings. A comprehensive data section supplies some useful information for industry.

* * *

The latest addition to literature published by A. Gallenkamp & Co., Ltd.—Publication No. 510, October, 1947, announces three new-design laboratory furnaces, viz.: 5756 low voltage tube furnace; 5770 silicon carbide element tube furnaces; and 19875-19875/1 muffle furnace.

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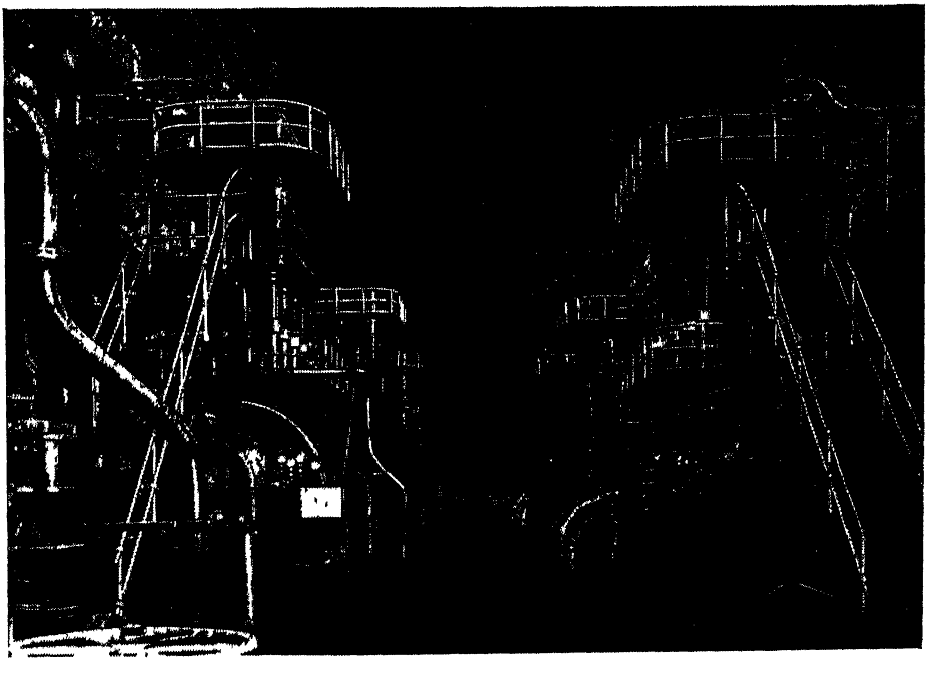


Chemical engineering on the grand scale, represented by a compressor plant for chemical industry recently installed by Peter Brotherhood, Ltd.

CHEMICAL OUTPUT IN JAPAN

According to Report No. 22 (June) of Non-Military Activities in Japan, issued by the Supreme Commander for the Allied Powers, production of basic heavy chemicals continued at about the same level as in the previous month, the production index (in per cent of estimated requirements for a balanced economy) standing at 44, against 43 in May. The largest decline took place in the manufacture of finer types of dyes and their intermediates. On the other hand, calcium superphosphate production increased by 18 per cent to 67,340 metric tons, reflecting the temporary availability of pyrites. Ammonium sulphate production, however, decreased in June by 11 per cent to 67,429 metric tons as a result of lower electricity supplies and the need to close down work for repairs. A seasonal increase in the production of carbide made possible a post-war record output almost 25,000 metric tons of cyanamide—nine per cent above the May figure.

There was a decline in the output of sulphuric acid from 129,924 metric tons to 122,755 metric tons, but output of nitric acid rose to 770 metric tons against slightly more than 600 metric tons in the previous month.

There was a general decline in the sodium industries owing to lower coal allocations. Caustic soda output aggregated 4130 metric tons, of which 3761 metric tons were made by the electrolytic process. This figure compares with a peak of over 10,000 metric tons electrolytic soda manufactured in 1940. Common salt production was little changed at about 9000 metric tons, comparing about 53,000 metric tons in 1939. Other results in June included· benzene from 53 to 607 and dyestuffs, 128 to 217.

TECHNICAL PUBLICATIONS *(cont. from overleaf)*

A useful gesture towards facilitating international business is the inclusion in the current issue of the catalogue of the Farrar Boilerworks, Ltd., of a miniature French-Spanish-English dictionary of technical terms descriptive of various items of essential plant. Equally useful for overseas buyers are the many good illustrations of large-scale boilers and pressure vessels, elevators, and bagging machines.

* * *

According to a recent U.S. estimate, about 10 per cent per year of newly cut timber replaces wood decayed in use. In this country the figure may be even higher because any rot in buildings has greatly increased as a result of the wartime priority calls on timber—a situation that has even now not vastly altered. In the prevailing scarcity, therefore, "Decay of Timber and its Prevention," published for the D.S.I.R. by H.M.S.O., price 13s., post free, makes a welcome and timely appearance.

* * *

A 78-page publication that has just made its 50th annual appearance is "The Soap Makers' Directory" to which has been appended a list of candle makers forming a useful and up-to-date guide.

* * *

"Rhodium—Engineering Properties and Uses" is the title of an illustrated 6-page pamphlet just published by Johnson, Matthey & Co., Ltd. One of the six metals of the platinum group, all of which have high-melting properties, rhodium is of particular interest to chemical manufacturers having high resistance to chemical attack.

For more than 200 years crucible steel from Sheffield has been the substance from which fine tools have been made for use all over the world. And so versatile is crucible steel that it has gradually been applied to purposes almost without number. The importance of the material makes it worthy of the interesting monograph devoted to it, which has now been issued in an attractive "pocket edition" by John Vesey & Sons, Ltd., Sheffield.

* * *

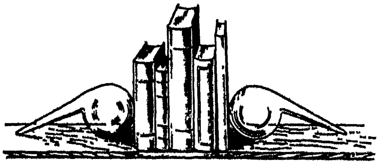
Murex, Ltd., has published a new edition of the booklet "Standard Specifications and Typical Analyses—Metals, Metallic Alloys and Carbides," which in the past has been widely used for reference by users of ferro alloys and pure metals, metal powders and metallic carbides. It has now been brought up-to-date by the addition of new products.

* * *

The latest "Ciba Review" (No. 61) fully maintains the tradition set by its predecessors of presenting an informative and graceful study of one or another branch of craftmanship in which to-day dyes perform an essential function. The subject on this occasion is gloves, and the record presented of these, from the Middle Ages to the 18th forms a unique contribution of permanent interest.

* * *

A 72-page catalogue issued by Driver-Harris Company, of Harrison, N.J., describes a number of heat- and corrosion-resisting alloys, and provides a useful reference book for the metallurgist, engineer and designer, as well as for the manufacturer who employs such materials in any of his processes or products. Information and specifications are given with regard to properties, applications, life expectancy, and current temperature characteristics.



A CHEMIST'S BOOKSHELF

Chimie Organique. By A. Kirrmann, Paris. Collection Armand Collin, 1947. Two volumes 220 and 195 pp. Each 100 fr.

The book comprises two volumes, of which the first deals with general organic chemistry, its main questions and theoretical problems, the second with its simple functions, exposing the fundamental bases of descriptive organic chemistry. Very few books in French are available in such a short and yet concise and popular form. The author, who is Professor of the University of Strasbourg, has obviously utilised his academic experiences and thus the two books follow a well designed and well executed scheme and the student who works through them conscientiously will not only have attained a good grasp of the main principles of elementary organic chemistry, but will be well prepared for further studies. Twenty-six figures and an exhaustive list of references and of bibliographic and monographic sources provide great help to such further studies. A third volume, dealing with complex functions, is to follow.

The Methods of Cellulose Chemistry. By Charles Dorée. Chapman and Hall, London. Pp.X + 543. 42s.

The experimental investigation of cellulose in its various aspects—as a chemical substance, as a structural colloidal unit and as a primary constituent of plant cells—necessarily involves specialised methods. These methods, which have been gradually evolved during the last fifty years, are described in a wide literature which includes the standard journals devoted to chemistry, physics, botany and biochemistry, and on the technical side those dealing with textiles, dyeing and colloids. There are, in addition, the publications of institutes and conferences concerned with various aspects of cellulose research. Some of the methods, in more or less detail, have found their way into the text-books on cellulose which have appeared in recent years, but it is nevertheless often difficult for the student, who is commencing work on cellulose, to find easily the experimental details he requires. The present book, compiled from notes made for the author's own students, will assist in removing this difficulty. It should prove useful both to the student about to undertake research in the wide field offered by cellulose and the substances associated with it in the plant world, and also to workers in laboratories controlling and investigating the manufacture of cellulose products.

A Rational Approach to Chemical Principles. By J. A. Cranston. London: Blackie & Son Limited, 1947, pp. VII + 211, 8s. 6d.

This book abandons the historical approach to chemistry in favour of a rational one. The physicist's atom is the starting point. From this, the fundamental laws of chemistry, the concepts of valency, the reactivities of the various elements and the ionic hypothesis all emerge in a rational way. Without entirely sacrificing contacts with the history of chemical science, the book explains the modern view in a manner that will be easily understood by the average student. The text is dealt with in five parts, entitled: The Structure of Matter; The States of Matter; Chemical Combination; Electrically-Charged Atoms and Chemical Equilibrium. An abundant number of figures and tables as well as 70 problems (with answers) make the book a very useful manual for teachers and students of modern chemistry.

Thorpe's Dictionary

We have been asked to make it clear that in Vol. VIII of this book (THE CHEMICAL AGE, August 23) two very comprehensive chapters on nitrogen were provided by J. R. Partington, M.B.E., D.Sc., Professor of Chemistry in the University of London (Queen Mary College), *viz.*: Nitrogen (pp. 497-543) and Nitrogen, Atmospheric Utilisation of (pp. 544-582).

"Electroplating"

A new monthly technical publication, whose general appearance, subject matter and lay-out, should appeal to users and manufacturers of metal finishes, *Electroplating*, has now made its promised appearance. Featured in this, its first issue, is the first instalment of "Metallography of Electrodeposited Surfaces" by Dr. A. T. Steer, research metallurgist, of the Rover Company. The liberal allowance of 40 editorial pages includes a substantial account of the Third International Conference on Electrodeposition held last September. The patents section displays a useful tendency to comprehensive description.

Home News Items

Directorate of Mica.—The address of the Directorate of Mica (Board of Trade) is now: 23 Buckingham Gate, Westminster, London, S.W.1. (Tel. No. VICtoria 7503).

Shell-Mex Explosion.—A serious explosion which occurred at the oil-washing and filling sheds of the Shell-Mex installations, Old Trafford, Manchester, on Saturday last, resulted in serious injuries to five employees. Damage was caused to filters and electric motors.

Purchase Tax on Drugs.—The British Medical Association has sent a protest to the Ministry of Health against the application of the recently increased purchase tax to many classes of drugs, many of which are in constant use. The increase, the B.M.A. points out, is bound to be reflected in increased cost of medical service.

Oil and Colour Chemists' Dinner-Dance.—Consequent upon the Ministry of Food's Meal Restriction Order, the Bristol section of the Oil and Colour Chemists' Association has cancelled its plans for this year's dinner-dance, and will hold instead a running buffet and dance. Since most members have lost their petrol ration, transport is to be arranged.

Rubber Industry Work Hours.—Agreement on a forty-five-hour week, reached by the National Joint Industrial Council for the rubber-manufacturing industry, will take effect from the first full pay period after December 7. For the present, however, the council recommends no general reduction in actual working hours. Hours of work in each factory will be decided locally.

Pension Scheme for Chemical Works.—A contributory pensions scheme for all adult employees of British Glues & Chemicals, Ltd., and associated companies (Croid Ltd., B. Young & Co., Ltd., Calfos Ltd., Standard Soap Co., Ltd., Personality Beauty Products, Ltd., and O. Murray & Co., Ltd.), comes into operation this month. The fund which embraces all employees over 21 according to their years of service has received an initial contribution of £50,000 from the company.

U.K. Machinery for Shell.—From May 1 to September 30, the Shell Petroleum Co., Ltd., placed orders for oil industry equipment worth £874,000 with 11 Yorkshire firms, and in the last 2½ years there has been a steady rise in orders placed in Yorkshire. Before the war, America had a virtual monopoly of the supply of oil machinery throughout the world. In the year ended June 30, 1946, Shell contracts with Yorkshire firms amounted to £1,250,000.

Strike Settled.—An agreement with the factory management for full recognition of their union has ended the eight weeks' strike of 26 employees of Dent and Co., and Johnson, scientific instrument makers, Lipwood, Renfrewshire. The men returned to work on November 17.

Another Fire at Brotherton's.—A tar-storage tank which exploded at Brotherton's tar distillery, Litherland, near Liverpool, on Monday last, started a large fire—the second within a week—which destroyed 1000 gals. of tar. The explosion is believed to have been caused by a spark igniting vaporised tar in the tank concerned.

£100 Prize in Welding.—The Council of the Institute of Welding has accepted the offer of the British Oxygen Co., Ltd., to provide a prize of £100 a year for three years, to be known as the B.O.C. Welding Prize; it is to be awarded annually for a paper submitted by a member of the Institute on some aspect of gas welding. The terms of the competition will be announced shortly.

U.K./Eire Exchange Agreement.—A Government announcement last week stated that an agreement has been reached with Eire whereby that country will receive "a substantial additional quantity of coal" next year together with certain raw materials and machinery, as well as 15,000 tons of fertilisers in the form of superphosphate and basic slag. This will be compensated by additional shipments of Irish food to this country.

OFFICIAL NOTICES

THE Board of Trade states that, despite continued lead shortage, a limited quantity has been set aside (additional to the schedules sponsored by the British, Dominion and Colonial Governments) for export to selected markets. Firms interested in the following markets should apply for licences to the Export Licensing Branch: Central, South and North America (excluding European Colonies), Portugal (and Colonies), Sweden and Switzerland. Applications must be made before December 6.

Siloxanes.—Exemption from general *ad valorem* duty of siloxanes (whether polymerised or not) has been granted by a Treasury Order made last week. The Order (Import Duties (Exemption) (No. 4) 1947, H.M.S.O., No. 2306) also relates to certain mixtures containing 50 per cent or more by weight of siloxanes.

PERSONAL

Changes at Guest, Keen & Baldwins

THE following changes in directorships have been announced by Guest, Keen & Baldwins: Mr. E. J. Pode and Mr. W. F. Cartwright have resigned consequent upon their appointment as directors of the Steel Co. of Wales. Mr. T. Jolly has been appointed joint managing director with Mr. C. R. Wheeler, who had previously shared that post with Mr. Pode. Other appointments are: Mr. J. B. Deakin, works manager at East Moors works, and Mr. W. Smith, assistant works manager. Mr. P. T. Hughes is now the company's chief accountant.

British Colour Appointments

At the annual general meeting of the British Colour Makers' Association the following officers and council members were appointed for the 1947-48 session:— Chairman, Mr. H. G. Ferguson (Cornbrook Chemical Co., Ltd.); vice-chairman, Mr. V. Watson (Cromford Colour Co., Ltd.); hon. treas., Mr. C. G. A. Cowan (Cowan Brothers (Stratford), Ltd.); secretary, Mr. Allan J. Holden. Council: Messrs C. M. Beavis, K. Burrell, C. G. A. Cowan, H. G. Ferguson, J. H. Grimshaw, S. K. Roberts, V. Watson, H. A. Wilson.

Mr. Ashley S. Ward, chairman of Thos. W. Ward, Ltd., and other associated companies, has relinquished the chairmanship of Lowmoor Best Yorkshire Iron, Ltd., and Mr. George Wood (deputy chairman of Thos. W. Ward, Ltd.) has been appointed in his place. Other changes include the election of Mr. C. L. Fry and Mr. W. W. Hickman as directors, and the appointment of Mr. Fry and Mr. R. Stubbs as joint managing directors. Mr. G. F. Hanson has assumed the position of works manager.

Mr. J. E. Robinson, chairman and managing director of John Barrington and Sons, Ltd., Dublin, the oldest soap manufacturing firm in Ireland, has been presented with a silver salver and a grandfather clock on his retirement after 50 years' service with the company.

Mr. F. E. Bancroft, of Manchester, has been awarded the premier award of the Junior Institution of Engineers, for his paper "Penicillin and the Freeze Drying Process."

Mr. W. Mure has been appointed a director of Tin Smelters, Ltd.

Royal Medallists

Prof. Hinshelwood and Dr. Burnet

THE Royal Society announces: H.M. the King has been graciously pleased to approve the recommendations made by the Council of the Royal Society for the award of the two Royal Medals for the current year as follows:

To Professor C. N. Hinshelwood, F.R.S., for his distinguished work on the mechanism of chemical reactions from the simplest gas phase processes to the complexities of cell division; to Dr. F. M. Burnet, F.R.S., for his distinguished work on bacteriophages, viruses and immunity; and for his contributions to the study of infectious disease as an ecological phenomenon.

The following awards of medals have been made by the president and council of the Royal Society:

The Copley Medal to Prof. G. H. Hardy for his outstanding part in the development of mathematical analysis in England during the last 30 years.

The Davy Medal to Prof. L. C. Pauling, for his distinguished contributions to the theory of valency and for their application to systems of biological importance.

The Buchanan Medal to Sir Edward Mellanby, for his distinguished researches on the physiology of nutrition, especially in relation to the causation of deficiency diseases.

The Hughes Medal to Prof. J. F. Joliot, for his distinguished contributions to nuclear physics, particularly the discovery of artificial radioactivity and of neutron emission in the fission process.

Dr. Walter Ramsden, of Pembroke College, Oxford, Senior Fellow of Pembroke College, Johnston Professor of Biochemistry, Liverpool University, 1914-31, and formerly Lecturer in Chemical Physiology, Oxford University, left £23,211, net personalty £23,169.

Obituary

Mr. W. J. U. Woolcock

Chemical industry has lost a valuable organiser and a distinguished chemist by the death at the age of 69 of Mr. W. J. U. Woolcock, C.M.G., C.B.E., president of the Society of Chemical Industry from 1924 to 1926. During his term of office he was largely responsible for the representative review of chemical industry at the Wembley Exhibition. He was appointed in 1918 general manager of the Association of British Chemical Manufacturers, holding that office for 10 years, in the course of which he served on several Government committees, notably in the course of the 1914-18 war. He was also P.P.S. to the Minister of Munitions.

Overseas News Items

Courtauld's Australian Plan.—Courtaulds, Ltd., is reported to be planning to spend £2 millions over a five-year period on the construction of a factory near Newcastle, N.S.W.

U.S.A. Re-exports of Soda.—Soda ash and caustic soda have recently arrived in Argentina from the United States, being chiefly re-exports of Belgian origin. Brazil has also taken some deliveries.

Rising Tin Output.—The Malayan tin industry has made rapid progress during the past six months and production in September at 3553 tons was over 130 per cent higher than in March. At the end of September there were 439 tin mines operating, compared with 382 at the end of July, and 293 at the end of April.

A New Rubber.—An acrylic elastomer known as Lactropene EV, developed by the U.S. Department of Agriculture's Eastern Regional Research Laboratory, is now being made on pilot plant scale at U.S. Government Laboratories, operated by the University of Akron (Ohio) as agent for the Office of Rubber Reserve.

New Coalmines for Italy.—In order to offset the effect of the loss of coal production incurred as a result of the secession of Venezia Giulia to Jugoslavia, a number of coalmines are to be opened in Sardina, each of which is said to be capable of achieving an annual output of a million tons. A coal basin covering 7500 acres is said to have been discovered in Abruzzi Province. Some petroleum, bauxite and iron is believed also to exist there.

Italian Acid and Soda.—Northern Italy has raised output of sulphuric acid since the beginning of 1946—when output was at a rate of about 20 per cent of pre-war production—to about 70 per cent to-day. The change in production of electrolytic soda has been even more remarkable. Output started with over 60 per cent of the pre-war figure and climbed steadily to 80 per cent in September, 1946. Shortage of electric power during the first quarter of 1947 cut output to as litttle as 40 per cent. As soon as the conditions improved and restrictions on power consumption were removed, the output soared to nearly 100 per cent of the pre-war level in May. Prospects for electric power supplies are now not good and a decline during the next few months is likely.

Austrian Silver Nitrate.—A company in Hall, Austria, has recently resumed the production of silver nitrate at a rate of about 300 kg. per month.

Pyrites From Spain.—The shipment of some 115,000 metric tons of pyrites has been arranged by the Spanish authorities. Of this total, Belgium and Holland will take each 50,000 tons, the remainder going to the Anglo-American occupation zone of Germany.

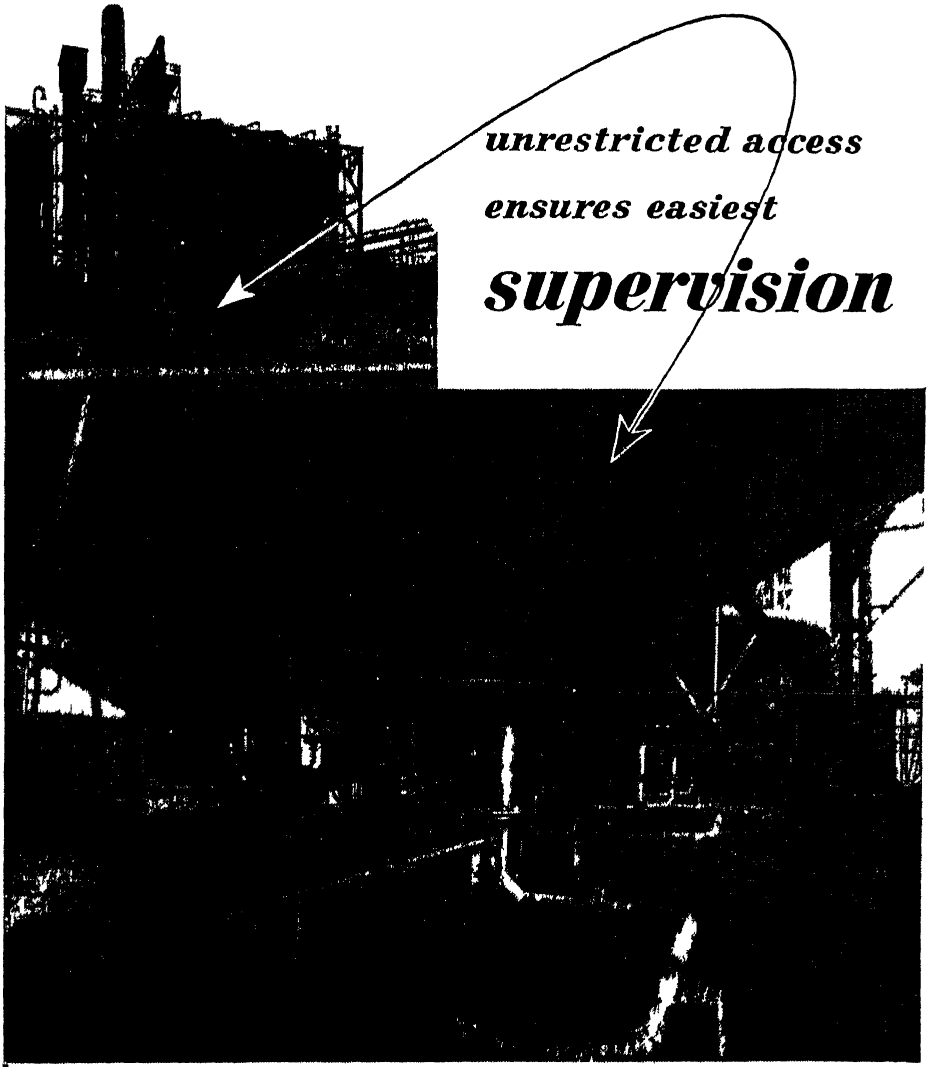
German Potash Output.—Although potash production in the British occupation zone of Germany in the third quarter of this year amounted to 62,000 tons (53,000 and 25,000 tons in the first and second quarters, respectively), the target of 214,000 tons for the year is not likely to be reached.

Sulphuric Acid in Holland.—The Sulphuric Acid Co. of Ketjen has installed a second unit for the production of contact sulphuric acid, supplies of which should now meet the total needs of Holland. Output is scheduled at 30,000 tons a year. Part of the apparatus was obtained from Dutch manufacturers.

French Coal Prices Up.—Consequent upon a French Government decision to terminate the subsidy on coal—the difference between the subsidised price (1350 francs a ton) and the cost price is estimated at 1000 francs—there has been an increase of about 60 per cent per ton in the selling price, viz., 2160 francs a ton.

Czech-Soviet Trade.—Czechoslovakia is to supply the Soviet Union with pharmaceutical products valued at 25 million Czech crowns, while the country's metal industries have signed contracts for the supply of 400,000 tons of iron ore and of 70,000 tons of manganese-ore; 10,000 tons of asbestos and some 3000 tons of chrome-ore are also to be delivered.

Cameline Oil.—Italian chemists are experimenting with cameline oil which is obtained from the Gold of Pleasure plant. They are concerned with the possibility of utilising the drying properties of this oil in view of the prevalent shortage of linseed. The oil content varies from 33 to 39 per cent in different parts of the world. Its characteristics, including a thiocyanogen number of 101, indicate a similarity with linseed oil. Practical tests carried out with paints in which cameline oil has been used, show that a drying time of about 36 hours is required. This compares with about 21 hours for linseed oil. Covering power and other properties are said to be similar.



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Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

BALDWIN CHEMICAL INDUSTRIES LTD., Waltham Cross. (M., 22/11/47.) October 21, debenture, to Barclays Bank Ltd., securing all moneys due or to become due to the Bank; general charge. *—. July 1, 1946.

New Companies Registered

Burgess Chemicals and Export, Ltd. (444,805).—Private company. Capital £100. Directors: G. Burgess, and W. B. Lessing. Registered office: 121 London Wall, E.C.2.

Cochran Chemical Co., Ltd. (25,863).—Private company. Capital £1000. Directors: W. C. Galbraith, W. C. Cochrane, A. W. Chisholm, and Dr. J. Cochran. Registered office: 9 Barns Street, Ayr.

John Calder & Co., Ltd. (25,878) —Private company. Capital £1000. Importers of and dealers in sand, fire bricks, refractories, chemicals and fertilisers, etc. Directors: R. S. Calder and J. C. M. Kerr. Secretary: John N. Orr. Reg. office: 163 Hope Street, Glasgow, C.2.

Finegrades, Ltd. (445,054).—Private company. Capital £100. Manufacturers, importers and exporters of and dealers in chemicals, fine chemicals and chemical products, etc. Directors: J. W. Cox and C. E. Paddon. Reg. office: 76 Princes Gate Mews, S.W.7.

Happe Products, Ltd. (411,883).—Private company. Capital £5000. Manufacturers of and dealers in plastics, chemicals, gases, drugs, medicines, etc. Directors: C. Schight, G J. Selbie and E. L. Selbie, W. R. J. Happe, and R. F. Selbie. Registered office: Room 150, 20 Copthall Avenue, E.C.2.

Jacksons Fertilisers, Ltd. (444,934).—Private company. Capital £1000. Manufacturers and importers of and wholesale and retail dealers in fertilisers, manures, chemicals, insecticides, fumigants, fungicides, disinfectants, weed killers and washes, etc. Directors: J. Jackson and N. F. R. Gill. Reg. office: Park Hall, Longton, Staffs.

Company News

Distillers Company, Ltd., has declared an interim dividend on the ordinary stock for the year ending March 31, at 3 3/5d. per unit of 1s., less income tax.

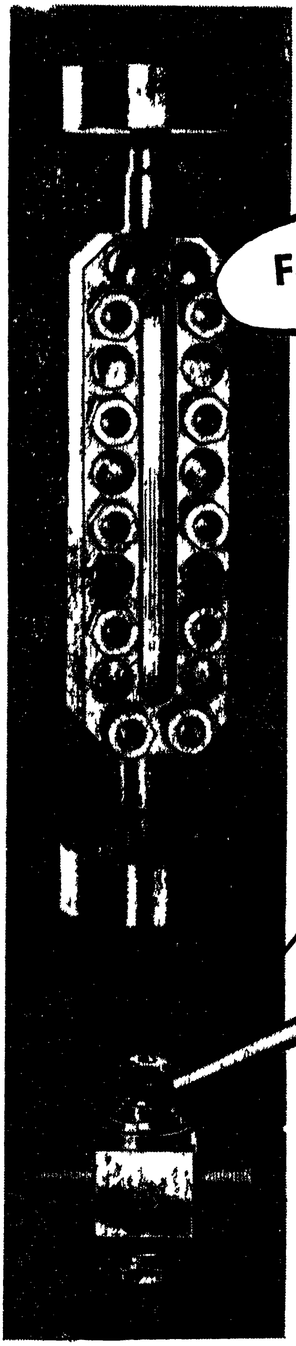
The nominal capital of **Synthetic Chemicals Ltd.**, Braemar, Cleckheaton, has been increased beyond the registered capital of £5000, by £495,000, in £1 ordinary shares.

The nominal capital of **Chemicals and Essential Oils Ltd.**, Astor House, 95 Aldwych, London, W.C.2, has been increased beyond the registered capital of £1000 by £4000, in £1 shares.

Increases of the nominal capital of nine Mediterranean petroleum companies are announced as follows: **Petroleum Development (Qatar), Ltd.**, by £1,600,000 (registered capital £2,540,100); **Lebanon Petroleum Co., Ltd.**, by £300,000 (registered capital £500,100); **Basrah Petroleum Co., Ltd.**, by £1,400,000 (registered capital £5,000,000); **Mosul Petroleum Co., Ltd.**, by £700,000 (registered capital £8,700,000); **Petroleum Development (Trucial Coast), Ltd.**, by £150,000 (registered capital £500,100); **Syria Petroleum Co., Ltd.**, by £1,200,000 (registered capital £2,250,100); **Transjordan Petroleum Co., Ltd.**, by £250,000 (registered capital £200,100); **Petroleum Development (Palestine), Ltd.**, by £700,000 (registered capital £920,100); and **Petroleum Development (Cyprus), Ltd.**, by £100,000 (registered capital £60,100).

Chemical and Allied Stocks and Shares

THE dramatic developments at the end of last week have dominated stock markets, where continued uncertainty has kept business at modest proportions. Immediately following the interim Budget, industrial shares made strong headway because Mr. Dalton's proposals were regarded as indicating no serious attempt to deal with inflation, while market calculations showed that in many cases the doubled Profits Tax will be offset in future results by the repeal of E.P.T. which takes effect as from the begining of this year. It was pointed out that this assumed that trading profits would be maintained in future, which as far as concerns companies limited to the home market is by no means likely owing to the emphasis on export markets. Then followed the resignation of Mr. Dalton. The City took the view that Sir Stafford Cripps would favour more definite methods in dealing with inflation; and in some quarters it was suggested that he might in fact



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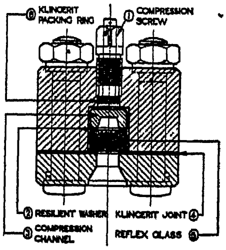

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odify the " cheap money " policy so carelly fostered by his predecessor.

It became clear following his first speech s Chancellor that for the time being at any ate Sir Stafford will support " cheap oney " but the City is still doubtful if the orthcoming big issue of British Transport tock can be made to carry interest at only ½ per cent. A 3 per cent interest basis is ow more widely expected. Industrial hares have eased, but in most instances re still above pre-Budget levels, shares of ompanies prominent in the export drive eing favoured.

Shares of chemical and allied companies noved fairly closely with the general trend, ut in many instances were higher on balnce, although best levels have not been eld. Imperial Chemical were 49s., and Fisons ordinary strengthened to 66s. 3d. elped by the success of the 4½ per cent preerence share issue. The latter shares hanged hands around 24s. or 1s. premium ver the issue price. B. Laporte were 33s. 9d., and W. J. Bush 87s. 6d., while in other directions, British Aluminium strengthened to 48s. 9d., although British Glues & Chemicals 4s. shares at 21s. 3d. lost part of an earlier rise.

Glaxo Laboratories at £22½ moved higher in view of market calculations that doubled Profits Tax will not bear heavily in this case, because it will be offset by the absence of the E.P.T. provisions in future. British Drug Houses 5s. shares at 13s. 3d. have also been favoured on similar grounds and on attention drawn to the company's big export trade. The units of the Distillers Co. fluctuated moderately around 28s., United Molasses were firm at 48s. 9d. British Plaster Board steadier at 22s. 3d., and Turner & Newall higher on balance at 76s. 3d. Iron and steel shares have been steady, helped by the encouraging coal output news. Tube Investments at £6⅝ strengthened following the raising of the distribution from 22½ per cent to 25 per cent, and Stewarts & Lloyds (54s. 6d.) rose in sympathy. United Steel changed hands around 26s. 7½d. Dorman Long were 28s. 3d., awaiting the results, and T. W. Ward rose further to 49s. 3d.

Boots Drug became steadier at 57s., Sangers were 33s. 1½d., and Griffiths Hughes 41s. 10½d., but awaiting the £1,500,000 issue of 4½ per cent redeemable cumulative preference shares at par, Beechams deferred eased to 22s. British Xylonite shares were quoted at £7 "ex rights" to the new shares which were 22s. 6d. premium. Oils have been steadier with V.O.C. (95s. 7½d.) higher again under the influence of the increased interim dividend. Shell were 74s. 4½d. earlier in the week pending official details of the big share issue which is expected to raise £30,000,000 for the company's big refinery programme.

British Chemical Prices

Market Reports

CONDITIONS throughout the industrial chemicals market remain very much as have been reported over the past month. Buying orders, whether for home needs or for export, are by no means easy to place owing to the uncertainty of the forward supply position. Consumer delivery specifications under existing contracts are being met with promptness and the movement in the aggregate is fairly substantial. No price changes have been reported on the week, and the undertone is very firm, particularly among the potash chemicals. A brisk trade and a ready outlet for supplies sums up the position of most of the soda compounds, and this is also the case with such items as formaldehyde, acetone, the lead oxides and oxalic acid. Available supplies are fully absorbed in the coal-tar products market where conditions and prices remain unaltered.

MANCHESTER.—The chemical using industries generally in the Lancashire area are maintaining a steady rate of operations, with an upward trend in the cotton textile and allied industries; this is reflected in a sustained brisk demand for a wide range of both light and heavy chemicals. A steady flow of delivery specifications has been reported on the Manchester market during the past week and offers of new business both on home and export accounts have been fairly numerous. Values are strong in all sections. The tar products generally continue to find a steady outlet, with supplies tending to fall below requirements in several instances.

GLASGOW.—In the Scottish chemical market there has been a sustained demand over the whole range of chemicals, both heavy and light. There has been a steady increase in demand as new factories have been completed and there is scope for more chemical producers in the area. Natural resources invite such development. In the export market there has been a noteworthy demand from the Argentine for chemicals of all classes and, judging by reports, it seems likely that in the future this country will be buying considerable quantities of various materials from the U.K. There has been little demand from Spain, due to the very great difficulty of obtaining import licences. In general, the demand has been steady and some orders have again been received.

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Science and Government

SIR EDWARD APPLETON, 1947 Nobel prizewinner, whose scientific achievements have been associated primarily with the highly rarified region of the ionosphere —" the Appleton layer " which he himself called the "F layer"—was brought to earth in 1939 to become head of the D.S.I.R. under the title of secretary. The result of over eight years' work in that arduous post, covering the most active years of organised research known in this country, has been the formulation of views of the nature of organised and individual research that must command the highest attention from all concerned. These views were given permanent form and substance when he delivered the first Arthur Dehon Little Memorial Lecture a year ago at the Massachusetts Institute of Technology. The publication of this lecture in book form provides an opportunity to review the opinions formed by Sir Edward during his tenure of a post which is in effect that of Research Director to the British Empire.

Scientific workers of the 19th century placed disproportionate emphasis on " the pursuit of science with dignity." Theirs was a high calling, and in it there was no room for purely financial considerations. Trade was beneath the dignity of the aristocracy; no true scientist would "prostitute" his calling by applying his knowledge for the benefit of industry.

That spirit lingered on well after the first world war; Sir Edward, still a relatively young man, remembers hearing a British scientist boast that he could claim that what he had done could never be of the slightest use to anybody—a claim which later events confuted—though through no fault of his own.

The attitude to the functions of science was a purely Victorian conception. Sir Edward reminds us that, in his " New Atlantis," Sir Francis Bacon, contemporary of Queen Elizabeth and James I, described a plan for what was in effect a National Research Laboratory. Describing the staff of that laboratory, he wrote: " We have three that try new experiments such as themselves think good. These we call pioneers. We have three that bend themselves, looking into the experiments of their fellows and cast about how to draw out of them things of use and practice for man's life and knowledge. These we call Benefactors. Lastly, we have three that raise the former discoveries by experiments into greater observations, axioms and aphorisms. These we call Interpreters."

There we have the whole picture—the fundamental research workers; the pilot plant boys who try to put the discoveries of pure science to practical effect; the industrialists who bring discoveries of the first two into commercial application for the good of all. Sir Edward Appleton has clearly taken Bacon's conception as his own guiding principle, bringing it into line with modern requirements.

It matters not at all that the pure scientists may take no interest in the practical application of their work; that is the function of the Benefactors and the Interpreters. Pure research is predominantly the concern of the universities and, as Sir Edward notes, although carried out in a spirit of pure inquiry this free, fundamental research has shown an astonishing capacity for being useful.

The increasingly close association between Government, particularly one

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with the philosophy of the present Government, and research may have on scientific development a bearing too fundamental to be ignored. What should be the organisation of research? All organisation—or freedom for the individual to develop his peculiar gift? In the commercial field, the Government evidently can see no merit save in regimentation. The nationalised industries preserve a departmental privacy without enterprise and elsewhere controls and bulk buying tend to produce the same result.

Sir Edward and, we may conclude, the D.S.I.R., have room for the individualist and are prepared to give him his head with full support. "We must never forget the outstanding importance of the exceptional man. Most of the really great advances in science have been accomplished by small teams of workers led by a man with ideas. As one concerned, to some extent, with the organisation and support of science in Britain, I believe that a vital task is to see that these leaders, these men with ideas and inspiration, lack neither disciples, assistants, nor equipment. When such needs have been satisfied they should be left alone." Sir Edward said that and we are thankful for the reassurance. Industrialists all over the country will pray that Sir Edward may bite each member of the Government to infect them, severally and collectively with the germ of this idea.

It took a world war to convince politicians that they needed the help of scientists. To-day, while scientists are still regarded in the Civil Service as lesser fowl they have been accorded right of entry. Scientific and technical experts of many branches are firmly established as advisers to Government departments. There are Government laboratories in which experimental work required by the several Ministries can be done, and to which the Ministries can turn for advice. The change has shaken the older Civil Service to its foundations.

The Civil Service, however, is still ruled by old customs. How then can it be ensured that the work of the scientific departments shall be effective in the executive departments? Sir Edward's solution is on the same lines as that put forward for industry a few years ago by Sir Harold Hartley in his report to the F.B.I. It is the appointment of a Scientific Adviser in each department. But, evidently knowing the habits of the Civil Service, Sir Edward emphasises that "for such a scientific adviser to be effective it is necessary that he should be sufficiently senior in the Department hierarchy. His advice should be rendered to the highest level—the level at which policy is decided."

As a pointer to the lines on which future "official" research may develop it is worthy of note that its principal director is opposed to the division of research into "pure" and "applied." There is to his mind a certain suggestion of snobbishness about this division. He would prefer to divide it into three new classes: (a) free fundamental, the extension of the frontiers of knowledge; (b) objective fundamental, research designed to give insight and understanding rather than any immediate practical result, but relevant to some field of practical importance; and (c) applied research. Industrial laboratories may find it necessary to undertake all three types of research, though generally they will concentrate on the two last-named.

NOTES AND COMMENTS

British Oil Developments

RECENT development projects in chemical and allied industries have been relatively so abundant and on so large a scale that reaction to the announcement of the giant scheme by which the petroleum companies plan to build up the U.K. oil refining capacity is less lively than the speculation such an event would have aroused even a few months ago. The implications of the building scheme to cost substantially more han £100 million with which the Shell, Anglo-Iranian, Royal Dutch and other companies are concerned are, however, revolutionary enough from the viewpoint of industrial shape of things to come. The principal objective, making this country self-supplying and a supplier of petroleum products, of which all the world, not excluding the U.S.A., stands in need, is alone capable of profoundly relieving our economic troubles. The results which may conceivably be produced in chemical industry could be even more fundamental now that the potentialities of petroleum as a source from which flows a host of basic chemicals, solvents and plastics are fully recognised. The liberation of energy in chemical industry which so abundant and versatile a contribution to raw material supplies could produce might alone repay the vast capital expenditure in the course of a few years. Such considerations, however, are at the moment purely speculative. Of more practical significance is the knowledge that five years are likely to elapse before the scheme comes to fruition. Meanwhile, the tacit approval of the Government and its assurance of the necessary supplies of steel may be assumed and news of recent developments in the oilfields in the Near and Middle East, including extension of the pipelines, indicate that the project of which these refineries will be the culminating point has been well planned.

American Exposition

AMERICA'S 21st Exposition of Chemical Industries opening on Monday next in the Grand Central Palace, New York, seems destined to open at least some new horizons in chemical industry. The keys to current developments, now in many cases being shown for the first time, are of many kinds, but perhaps the most fruitful have been the fresh uses of familiar constructional materials and the provision of new ones with powers of endurance unequalled in chemical engineering history. Even more productive of results of direct value to industry will be the further surge in the rising tide of applications of plastics and synthetic resins which has reached greatly higher levels during and since the war. Typical examples are the water dispersion of synthetic resin replacing the customary drying oils in paints, which is said to be odourless, to dry in less than half an hour and to provide finish and durability of a high order, and a polyvinyl acetate copolymer emulsion providing a ready-to-use cold glue. These are characteristic of the more practical uses of recent chemical progress; of even wider interest in this country will be the fundamental advances in instrument technology, in which the New York Exposition may be expected to provide fresh impetus here in the extension of automatic controls and continuous processing.

Wagon Crisis

THE incompatibility of the five-day week in industry and the need to run all industrial equipment at its maximum capacity is proclaimed once more by Sir Stafford Cripps's recent warning of the urgency of rapid handling of railway wagons—which, like coal, are capable of bringing all the heavy industries rapidly to a state of partial paralysis. One reasuring fact that the current shortage of rolling stock has served to underline is that the railways, living as they do in the devitalising shadow of the Transport Ministry, still preserve a directness and vitality which enable them to deal with an emergency, of which the present dearth of freight wagons is certainly one, with refreshing directness. The spirit born in the blitz is not wholly defunct. The specific evidence of this comes from the L.M.S.R., whose service representative was at some trouble this week to ensure that THE CHEMICAL AGE was fully acquainted with the background to the present wagon shortage and with present and future plans to accelerate the turn-round. Briefly, the situation demands that all wagons must be "returned empties" within 48 hours of acceptance at their loaded destinations and, because failure may have disastrous results for industry, the present demurrage charges of 6s. per day after 48 hours are to be "drastically increased—and rigorously enforced" wherever failure to comply is not unavoidable.

Footing the Bill

THE fact that a wagon makes a convenient addition to a factory's storage space is apparently one of the factors which have helped to produce the present situation. Hereafter, the charge of perhaps one or two guineas a day rental will induce a more public spirited policy among the "black sheep." For others the necessity of clearing all wagons within two or three days at the longest represents another form of indirect taxation. Some firms—I.C.I. were mentioned—are already paying overtime to secure that their wagons are cleared at week-ends. By Government sanction week-ends are national leisure period; Government edict demands—reasonably enough—that railway wagons must not stand laden from Friday to Monday. Industry is privileged to rationalise the paradox—and pay the bill.

World Library of Chemistry

AFTER a temporary suspension a well known tool of research and documentation is resuming publication in Berlin, under the editorship of Eugen Klever, who discusses some of his methods and policy in *Chim. et. Ind.*, 1947 (9), *58*, 290-3, together with some suggestions for an international documentation service. It is claimed for the *Chemisches Zentral-blatt* that its service before the war was unique in the promptness with which its abstracts were issued, the vast and varied field surveyed, and especially in the analytical tables which formed a prominent and invaluable feature of the publication. In 1937 no less than 71,062 abstracts were prepared and published from 3000 periodicals, utilising the services of 400 qualified chemists. The analytical table contained 175,000 references and the formulæ index gave information about 36,000 organic compounds. Although the present organisation, number of journals available and so on, cannot hope quickly to reach the prewar level, every attempt will be made to build up to and surpass that level in due course; a large number of chemists are available as collaborators or abstractors.

International Exchange

IN a larger international scheme the Editor suggests that, pending such a consummation, it should be possible to arrange interchange of journals and abstracting services between countries. The essential conditions for such a service would include: (1) publication within the shortest possible time of abstracts edited by experts from world-wide sources; (2) a continual index as basis for up-to-date information on any subject; (3) availability of all originals in a central library whence photo-copies of micro-films could be promptly supplied; (4) complete annual index and analytical table. To implement the ideas a Centre International de Documentation (C.I.D.) will have to be organised, publishing results of its work in three languages—English, French, German. Close collaboration between similar documentary bodies in individual countries will be necessary and in the very important matter of indexing it is suggested that the liaison offices in other countries—the various local editorial centres—should, in sending in their abstract contributions, include a note as to indexing. The abstracts themselves would all be of uniform pattern. The central library should be entitled by UNO or UNESCO to receive copies of all periodicals and books relevant to the fields of research to be covered. No doubt can exist about the desirability of recreating quickly on the widest scale this international source of chemical information, or of its title to widespread support in the interest of world relationships, as well as of science.

Monsanto's New Laboratories

NEW research laboratories which Monsanto Chemicals, Ltd., are building at their Cefn Mawr factory will cost more than £100,000, and will provide most up-to date research facilities as part of the £2,000,000 development scheme announced earlier this year. The latter includes a new factory at Newport (Mon.). The buildings have been described by Dr. W. D. Scott, chief chemist, as strictly functional in design, but pleasing in appearance, both internally and externally. They will contain fourteen separate laboratories and provide accommodation for seventy scientists and technicians. Care and attention have been given to the design of the physical laboratories as well as the well-equipped workshop and library. The whole will represent one of the most up-todate industrial research units in the kingdom.

BIG BRITISH PETROLEUM SCHEMES

Britain to have Two New Oil Refineries

IMPORTANT influences upon British petroleum and chemical industries are likely to result from the proposals just made by the Royal Dutch-Shell group for the financing of its development programme during the next two years, the significance of which is discussed elsewhere in this issue. The group, which had an output last year of 32,702,000 metric tons (eual to about 8.5 per cent of world production), as compared with 29,924,000 metric tons in 1938, has budgeted for capital expenditure of £105,000 million, a phenomenal figure even when allowance is made for the present high cost of plant, equipment and labour. The bulk of this sum, *i.e.*, 41 per cent, will be spent on refineries and chemical plants (excluding that of the U.S. Shell Union), followed by expenditure on oil production and exploration, absorbing 34 per cent.

Other development plans of special significance include the extension of research and chemical plants. It is well-known that a plant for synthetic soap has been built in Britain, and another is being erected in Holland. There can be little doubt that the overall expansion of the group's activities and the great attention devoted to refining in particular, will give a corresponding stimulus to the increasing activities in the chemical field.

Allocation of Capital

Marketing installations, which have been disorganised by the war and which also need much more expansion in view of the ever increasing world demand for oil products, account for 16 per cent, while 9 per cent will be spent on tanker construction.

Because of the well-known 60 : 40 division between the Royal Dutch and the Shell, the latter will find some £42,000,000 by the end of 1949, with £28,100,000 to be derived from the proceeds of an issue of 9,648,544 ordinary shares of £1 each.

Of the three main operating companies of the group, the Anglo-Saxon Petroleum Co., which has producing interests in various parts of the world, and which runs refineries and carries out oil research in the Empire, will spend £70 million; the N.V. de Bataafsche Petroleum Mij., owning producing and refining interests in Holland, the Netherlands East and West Indies, etc., will find about £25 million, while the marketing company, Shell Petroleum Co., will spend some £10 million.

Chiefly as a result of the expected increase in the production of the fields in Kuwait, Arabia, an expansion of the group's refinery capacity became imperative. By the end of 1949, refining capacity will total 36,750,000 tons per annum, as compared with the present figure of 29,750,000 tons per annum.

British and Foreign Refineries

In this country, two complete refineries are to be erected, one on the Thames, the other on the Manchester Ship Canal, where the Shell Chemical Manufacturing Co. is already constructing a plant for the manufacture of chemicals from oil. Furthermore, the Pernis refinery, Rotterdam, is to be extended and a reconstruction and extension of the refineries in the Netherlands East Indies and in British Borneo are to take place. The refining facilities in Venezuela are to be increased to handle the growing output of that country—which occupies the second position in the list of world producers—and last, but not least, the Haifa refinery, in which the group has a 50 per cent interest, is to be expanded to deal with the additional crude which will reach the coast of the Eastern Mediterranean from the new pipelines at present under construction by the Iraq Petroleum Co. When completed, these pipelines will treble the present rate of delivery of Iraq crude oil.

The group's circular reports that considerable progress had already been made in repairing and restoring facilities in war-ravaged areas. Output in British Borneo aggregates nearly 7000 tons a day, while in the Netherlands East Indies, where the group could not yet regain all major fields, output runs at some 3600 tons a day.

7000 TONS OF ENGLISH OIL

DURING the past seven years, 7000 tons, or 2,000,000 gallons, of oil have been pumped from small reservoirs below ground in the fields around the main bore hole at Formby (Lancs.) by the D'Arcy Exploration Co., a branch of the Anglo-Iranian Oil Co. It is stated that there may be important developments if exploratory boring with a new type of drill, whose tip is already two miles below the surface, is successful. Main resources may be below an unusually hard layer of rock. Portable equipment, consisting of a derrick and two mobile pumps, is being sent from Eaking (Notts) oilfields for this work. The holes will vary in depth from 100 to 1500 feet. Apart from the quest for oil in the deep shaft, company technicians have planned to make twelve new borings. The only other oil-producing area in this country is in Nottinghamshire, giving a total output in Britain of about 300 to 400 tons a day.

LARGE-SCALE WATER PURIFICATION

A PILOT plant is now being erected in the grounds of the Weizmann Institute of Science at Rehovot in southern Palestine; its purpose is the desalting of brackish waters in order to render them suitable for domestic and industrial uses. The water problem in Palestine is of the greatest importance for the effective colonisation of the country and the utilisation of saline groundwater found in many parts of the country, including the southern sandy waste known as the Negev, would open up new prospects of development.

The process is based on a discovery made public in 1935 by two English scientists, B. A. Adams and E. L. Holmes, who developed the use of synthetic resinous materials—ion-exchange materials—for the desalting of water. Instead of expensive distillation methods used hitherto, this process involves the percolation of saline waters through successive beds containing resinous ion-exchange material in granular form. In more recent years improved materials have been developed and the method is now used to purify waters in industry, primarily boiler-feed waters. However, the method as at present utilised in industry is far too uneconomic for large-scale use, such as irrigation.

Dr. Walter Juda, lecturer in chemistry at Harvard University, first thought of working out this process in a simplified form, adapting it to the special needs of Palestine. In 1945 an organisation, known as the Palestine Research Association, was formed at Cambridge, Mass., to make donations to Harvard University to support experimental research in the Harvard chemical laboratories on the problem of desalting water. The work was carried on by Mr. Morris Carron, under the direction of the late Prof. Jones and Dr. Juda, and sufficiently encouraging results were obtained to warrant the erection of the Rehovot pilot plant, which Dr. Juda and Mr. Carron are now supervising. The plant will demineralise water containing from 1000 to 2000 per million parts of dissolved salts (the ground water of the Negev falls into this category), bringing the salinity down to about 400-500 parts, which is sufficiently low for drinking purposes. Two thousand gals. of water can be treated daily.

It is also planned to investigate the recovery of water from the plant's waste waters by means of solar stills, as designed by Dr. Benjamin Siegel, who will join the Weizmann Institute of Science next year to do research work with the electron microscope. By using a combination of desalting solar evaporation processes the work now carried out at the Weizmann Institute will reduce waste and increase the yield of good quality water. In connection with the enlarging of the Institute at Rehovot a new housing scheme to accommodate scientists and technical staff has now been started.

One method of stepping up industrialisation will be in the extension of the country's chemical industry making use of oil by products and of the by-products of the Dead Sea Potash Works. Oil is still being sought in the south of the country, where drillers have already discovered fresh water. A second boring will shortly begin about 60 miles inland from the Mediterranean, while ravimetric and seismic tests are still being carried out in the region of the Dead Sea.

Expanding Use of Furfural

Discussing the development of furfural, a vital raw material of the petroleum, paint, rubber and other industries, Dr. L. B. Hitchcock and H. R. Duffey, of the Quaker Oats Company, told the American Institute of Chemical Engineers that the disposal of oat hulls was formerly a serious problem, but by 1943, the entire supply was used in furfural manufacturing, and corn cobs had to be used to augment the raw material supply. This chemical has made possible developments in other industries which have assisted materially in the growth of the chemical industry. The future for the industry appears bright as further uses and products of furfural are multiplying. From the 16 million tons of corn cobs annually available in the United States, three billion lb. of furfural could be produced.

Iron Powder Cores

Although German methods for manufacturing iron powder cores are generally similar to American methods, according to a report by the U.S. Office of Technical Services, better results are apparently obtained by the former. It is concluded that the carbonyl iron powders used in Germany are of better quality than American powders. Mixing and insulating materials, although containing the same components, are different inasmuch as the mixing is of longer duration and is done in a liquid medium. The general method is pre-insulation followed by drying the powder, then the main insulation; drying, pressing and ageing then ensue. Special attention is also drawn to the low carbon (0.1 per cent) and low nitrogen (.01 to .02 per cent) contents specified for some of the German powders.

U.K. TRADE IN OCTOBER

Marked increase in Chemical Exports

UNITED Kingdom exports in October were the second highest in value of the monthly totals since the war. The grand total for the month of £108.2 million represents an increase of £9.2 million since September, itself the second highest total since the year began, and is surpassed only by July's phenomenal return of £110.3 million.

Total imports at £161.428 million show proportionately much smaller increase—£720,000—continuing the tendency evident since August last, when total imports were worth £174.039 million.

Chemicals, drugs, dyes and colours just failed to maintain the high level of exports reached a year ago, the October total of £6.210 million representing a reduction of some £346,000. Imports under this head showed proportionately a steep increase to £3.364 million, against the £1.499 in October a year ago.

Exports of non-ferrous metals and manufactures increased by more than £405,000 to £4.090 million and imports in the same category more than doubled their value, contrasted with the corresponding total a year ago, £9.312 million.

Among the noteworthy changes in exports for the month of chemical and associated products was another very large increase in fuel and creosote oils, to 2295 million gallons compared with 138,330 a year ago, and substantial reductions in sales of most sodium compounds. Sharpest reductions were: sodium carbonate, 162,717 cwt. (1946, 458,278), caustic soda, 165,272 cwt. (1946, 210,310), chromate and bichromate 6 cwt. (1946, 1738). Sales of calcium carbide slumped to 1461 cwt (1946, 30,108) and there were many reductions on a smaller scale in other categories.

A summary of the principal totals is as follows:—

CHEMICAL EXPORTS

	Oct., 1947	Oct., 1946
	Cwt.	Cwt.
Citric acid	992	1,393
Formic acid	1,785	4,178
Tartaric acid	402	200
	Tons	Tons
Aluminium oxide	107	1,676
Sulphate of alumina	2,976	2,937
Sulphate of ammonia	19,891	21,526
Nitrate of ammonia	12,524	12,760
	Cwt.	Cwt.
Bleaching powder	42,192	66,887
Calcium carbide	1,461	30,108
	Gal.	Gal.
Benzol	6,794	95,824
Cresylic acid	198,283	232,663
Tar oil, creosote, anthracene oil, etc.	2,295,981	138,330
	Cwt.	Cwt.
Naphthalene	1,188	1,811
Nitrocellulose	2,238	2,490
Disinfectants, insecticides, weed killers, etc.	69,903	94,695
	Tons	Tons
Copper sulphate	1,900	3,629
	Cwt.	Cwt.
Glycerine	258	281
Nickel salts	11,141	7,744
Lead acetate, litharge, red lead, etc.	7,304	5,932
	Tons	Tons
Magnesium compounds	731	620
	Cwt.	Cwt.
Potassium compounds	7,414	7,507
Sodium carbonate	162,717	458,278
Caustic soda	165,272	210,310
Chromate and bichromate ...	6	1,738
Synthetic nitrate	—	2,320
Sodium silicate	10,518	24,673
Sodium sulphate	3,431	43,758
	Tons	Tons
Salt	15,049	15,968
Total value of chemical manufactures, excluding drugs and dyestuffs	£3,474,432	£3,413,640
	oz.	oz.
Quinine and quinine salts ...	116,658	155,371
	Mega units	Mega units
Penicillin	210,597	—
	lb.	lb.
Acetylsalicylic acid	49,478	163,545
Total value of drugs, medicines and preparations	£1,295,477	£1,663,348
Total value of dyes and dyestuffs ...	600,158	758,918

CHEMICAL IMPORTS

	Oct., 1947	Oct., 1946
	Cwt.	Cwt.
Acetic acid	13,364	9,604
Boric acid	—	690
Tartaric acid	—	2,280
Borax	2,940	6,000
Bromine and bromides	1,769	—
Calcium carbide	9,645	1,473
Coal tar products, excluding benzole and cresylic acid ...	4,996	1,426
	Tons	Tons
Phosphate	—	2,973
Manufactured fertilisers	4,654	24,918
	Cwt.	Cwt.
Potassium chloride	455,079	297,224
Potassium nitrate	—	692
Potassium sulphate	31,000	820
Sodium nitrate	29,910	—
Carbon blacks	63,393	70,979
Total value of chemicals, drugs, dyes and colours	£3,364,532	£1,499,689

Key Industry Duty Exemption.—The Treasury has made an order exempting chlornitrobenzol, ortho, and pentachlorphenol from Key Industry Duty, from November 15 to December 31. The Order is entitled "The Safeguarding of Industries (Exemption) (No. 8) Order 1947" (H.M.S.O., 1d.).

American Chemical Notebook

From Our New York Correspondent

CONTRARY to the general upward trend of prices during the past year, reductions have just been announced by two U.S. companies for important products used by the chemical industry. The Stauffer Chemical Company reduced the price of insoluble sulphur (85 per cent insoluble in carbon bisulphide) by five cents a lb. while the Bakelite Corporation reduced the price of polyethylene from 4 to 7 cents per lb. for the various grades. The Stauffer Chemical Company's price reduction is attributed to a new process of manufacture supplanting the process which has been employed since 1934. The main use for insoluble sulphur has been by the rubber industry in tyre carcass stocks, repair stocks, and in some types of mechanical rubber goods. Further price reductions for the chemical are expected to result when increased sales and further production economies are effected. The reduction of Bakelite's polyethylene is the second reduction in less than six months and the fourth since mid-1942, bringing down the price of the plastic material more than 60 per cent.

* * *

Financial statements just made public by the various chemical companies show increased profits and greater turnovers, as indicated below. All figures cover the nine-month period ended September 30. American Cyanamid Co., net income of $6,294,571 which compares with $6,191,005 for the same period last year. Net sales amounted to $155,099,434 as compared with $130,127,684 last year. Net profits of the Monsanto Chemical Company were almost double those of the first nine months of 1946 being $12,395,367 compared with $6,987,663 in 1946. British and Australian subsidiaries are, of course, excluded. Earnings do not include any recovery of profits under use and occupancy insurance as a result of the destruction of the Texas City plants last April. Reconstruction is said to be proceeding satisfactorily. General Electric Company's net income for the 1947 period was $56,459,434, compared with $404,109 for 1946, when the company's principal plants were closed for nine weeks by a strike. Net sales totalled $820,957,807 against $421,439,436. E. I. du Pont de Nemours and Co. has reported net earnings of $83,220,901, which compares with the 1946 figure of $82,179,876. Net earnings for other companies during the nine-month (unless otherwise stated) periods of 1947 and 1946 respectively were: Texas Gulf Sulphur Co. (quarter ended September 30) $5,483,870 and $4,249,886; Hercules Powder Co.—$10,057,668 and $5,631,636, sales being $98,969,694 and $72,453,609; Westvaco Chlorine Products Corporation—$1,954,214 and $737,060; Victor Chemical Works—$1,679,634 and $1,612,974; Sun Chemical Corporation—$996,670 and $925,785; Consolidated Chemical Industries, Inc.—$2,535,539 and $1,532,160; Interchemical Corporation—$2,320,159 and $1,239,546; Mathieson Alkali Works, Inc.—$2,076,646 and $1,431,803; United States Industrial Chemicals, Inc.—(six-month period ending September 30) $1,216,708 and $1,229,208, a slight decline.

* * *

Martin Bernhardt, general manager, has announced that the Chem-Tech. Products Corporation, 62 William Street, New York City, N.Y., has been formed to specialise in supplying foreign countries with chemicals and technical equipment and apparatus for laboratory development and pilot plant work and the sale of fine chemicals and pharmaceuticals.

* * *

A new technical booklet which for the first time includes a description of the properties and uses of all synthetic resins produced by the Hercules Powder Company, Wilmington, Delaware, was issued last week. The company's synthetic resins, most of which are rosin-base, have found application in a wide number of industries including protective coatings, adhesives, printing inks, paper and textile sizes, and essential oils and fixatives. Brief descriptions of the following groups of resins are included: Methyl esters of rosin; the cellolyns, first group of synthetic resins designed primarily for cellulose lacquers; ester gums; flexalyn resins, glycol esters of rosin; the lowisols, a series of rosin maleates; the pentalyn series of pentaerythritol resins; petrex resins; poly pale esters; and staybelite esters.

* * *

Earl W. Glen, chief of the Rubber Division, Office of Materials Distribution, U.S. Department of Commerce, in answer to rumours that allocations of general purpose synthetic rubber (GRS) were about to be re-imposed in the United States, has announced that sufficient supplies of GRS are available to make it unnecessary. Quarterly requirements have been diminishing, following revisions of R 1, the rubber order. Specification changes in the September amendment to the order will reduce still further the proportionate requirements for GRS, Mr. Glen stated, due to elimination of mandatory use of that type of rubber in non-transportation products. Flexibility in the operation of U.S. GRS plant facilities remaining active, permits sufficient expansion of production to take care of the high level of tyre manufacture.

U.S. CHEMICAL EXPOSITION

Review of Progress in New York Next Week

THE 350 exhibits comprising the 21st Exposition of Chemical Industries which will open in New York on Monday next, for six days, will present abundant evidence of the great advances made recently in all phases of the chemical and allied industries. The display—writes our New York Correspondent—will provide pointers to the sources of the recent great expansion of the major chemical industries. Chemical processing equipment has been newly developed or redesigned to utilise the latest advances in structural materials, permitting operations to be conducted far beyond former concepts of what such plants can endure.

Among the exhibits will be a group of chlorinated products, now coming out of a new 85-acre plant in West Virginia, including specialised emulsifiers for the food, cosmetics, insecticide and other industries, plasticisers for a wide range of materials and synthetic waxes. One of these has a high melting point and is offered as a lubricant in wire-drawing and also as an anti-blocking agents for plastics and rubber.

Photographs at one of the booths will reveal details of the first full-scale continuous solvent-extraction plant ever built for processing cottonseed. This is the first of three solvent extraction plants to be built along the Mississippi River in Arkansas, following an extensive pilot plant development.

550 New Chemicals

Many chemical agents are of such wide application that merely to depict their uses constitutes an effective display suggestive of still further applications. One such display will be devoted to reaction equations and flow-sheets for a great variety of industrial applications of liquid sulphur dioxide and liquid methyl chloride. In another exhibit there will be 550 samples of " new chemicals for industry " developed since the last exposition.

Versatility is an outstanding characteristic of most of the processing equipment to be displayed. Retorts, tanks, towers, grinding and pulverising equipment, as well as pumps, screens and separators, heat exchangers are well represented. Because of its dimensions and the great number of items displayed, such equipment occupies a large proportion of the exhibition space.

Other displays will reveal many advances in the processing and application of stainless steel and other highly resistant alloys, some of which have been radically improved. Several displays will demonstrate the special uses of non-ferrous metals in the chemical industries. For processors handling strong acids there will be an exhibit of lead lined products and equipment, including lead covered copper tubing, wherein marked cost reductions are offered through the adoption of improved manufacturing techniques.

Perhaps the most rapidly expanding group of materials is the plastics and synthetic resins, of which several entirely new applications will be shown. Ionic exchange synthetic resins for the removal of cations and anions from industrial waters will be offered in one of the more extensive displays of filtering equipment.

Special Purpose Plant

Equipment designed to fulfil special purposes continues to multiply and many examples will be on view. Pumps capable of producing very high vacuums are a vital part of the processes for producing penicillin, blood plasma, metal evaporation, lens coating, metal sintering and all sorts of drying and distilling operations. A new product that will be put on display is an automatic fraction collector for chromatographic work, which automatically collects and counts drops of fluid, depositing specified amounts in test tubes. These machines accommodate up to 200 test tubes.

Exhibited for the first time will be a fast-acting dissolver and disperser, said to be up to 20 times faster than conventional equipment. Its effectiveness is ascribed to a special impeller design which sets up shear between interfaces with a high velocity gradient, and circulates the entire contents of the tank through a high velocity area.

Instruments

Added to the fast-growing list of instruments which utilise the latest scientific developments will be a Geiger-counter fluorescence analysis unit and a portable radiation detector. There will also be an explosion-proof *p*H meter for industrial control, and another similar instrument which operates from the plant power line without use of batteries.

Other completely new instruments to be put on display at the show will include the infra-red gas analyser originally developed for atomic research; a micromanometer measuring water pressures in increments of 0.001 inch of water; an industrial cartesian manostat constructed to maintain constant pressure or vacuum to within one-tenth of one per cent; and a reversible humidity indicator for incorporation in optical instruments which gives warning of humidity in excess of any predetermined level and reverts to non-indication when humidity drops below the danger point.

IRON COMPOUNDS AND PHOSPHATIC FERTILISERS—III

STUDY OF CHANGES DURING STORAGE

by H. W. LEHRECKE, Ph.D.

THE earlier conclusion—that only amorphous $FePO_4$ and $H_3[Fe(PO_4)_2]2.5H_2O$ are readily soluble and that the crystalline forms of $FePO_4$ are insoluble for fertiliser purposes—was confirmed by investigating composition of the crystalline phases in equilibrium with the liquid phase of iron-rich superphosphate.

The superphosphate in question was made from Swedish apatite with a content of 7-8.5 per cent Fe, present in the form of haematite (Fe_2O_3) and magnetite (Fe_3O_4). In order to get a superphosphate with a high degree of water- and citrate-soluble P_2O_5 it was necessary to use a (10-15 per cent) larger quantity of sulphuric acid in relation to the raw phosphate (apatite) than for superphosphate made from ordinary raw materials, the iron content of which usually does not exceed 1.5 per cent.

Under these conditions the formation of dicalcium phosphate, $CaHPO_4$, which also is soluble in a solution of citrate of ammonia, but not in water, will not be possible because of the high acidity of the liquid phase, and the only compounds containing citrate-soluble phosphoric acid present in such superphosphate are compounds of iron (or alumina) with phosphoric acid.

If such superphosphate is exposed to a pressure of 15-20,000 kg. per sq. cm., a viscous, light red-brown liquid seeps out, containing between 30-35 per cent total P_2O

In order to find out the nature of the compounds between iron and phosphoric aci which are in equilibrium with such a liquid the following method was used:—

The liquid phase of the superphosphate i question always contained a certain quantity of divalent iron formed during th action of sulphuric acid on magnetit (Fe_3O_4) in the apatite used:—

$$Fe_3O_4+4H_2SO_4=FeSO_4+Fe_2(SO_4)_3+4H_2O$$

As long as the liquid phase is absorbe in the pores of the superphosphate the compounds of divalent iron dissolved in th liquid are not, or are only partly, oxidised but if the liquid pressed out from the pore comes into contact with air, oxidation divalent to trivalent iron proceeds rathe quickly. Because of the saturation of th liquid with compounds between trivalen iron and phosphoric acid, this oxidatio results in the precipitation of that compound of trivalent iron which is in equilibrium with the liquid phase in questio

The liquid phases which were pressed ou from superphosphate rich in iron afte different times and temperatures of storin and the precipitates formed in these liquid after contact with air, were investigated The results are given in Table 2.

From the analysis of the precipitates i can be concluded that diphosphatoferri

TABLE 2.

Number		1	2	3
Time of storage of superphosphate		3 days	1 month	1 month
Temp. „ „		room temp.	room. temp.	70°C.
Analysis of superphosphate	Percentage P_2O_5 total	16.50	15.79	15.72
	„ „ water- and citrate soluble	15.00	14.44	12.71
	„ „ water-soluble	9.22	7.41	8.11
	„ „ citrate soluble	5.78	7.03	4.60
	water and citrate-soluble P_2O_5, percentage of total	90.90	91.50	80.80
	Percentage free acids, expressed as equivalent amount P_2O_5	8.10	6.04	4.69
	„ humidity (free water)	14.48	15.78	14.67
	„ Fe_2O_3 total	4.89	5.27	5.43
	„ „ water- and citrate-soluble	3.55	4.45	2.82
	„ „ water-soluble	0.98	0.39	0.28
	„ „ insoluble	1.34	0.82	2.61
	water- and citrate-soluble Fe_2O_3, percentage of total	72.60	84.40	51.90
Analysis of liquid phase	Percentages P_2O_5 total	32.30	30.52	34.94
	„ Fe_2O_3	7.62	4.61	3.47
	„ SO_3	5.70	2.60	0.40
	„ CaO	0	0	0.88
	„ free H_3PO_4	25.85	30.84	40.90
Analysis of precipitates from liquid phase	Percentage P_2O_5	44.20	49.39	38.56
	„ Fe_2O_3	23.60	28.40	34.41
	molecular proportion P_2O_5 : Fe_2O_3	2.10	1.96	1.26
	theoretical proportion for:			
	$H_3[Fe(PO_4)_2]$	2.00	2.00	
	$FePO_4$	—	—	1.00

acid was in the equilibrium with the liquids from 1 and 2, but ferric phosphate with the liquid from 3, though complete equilibrium had not been attained. Furthermore, it can be stated that diphosphatoferric acid from sample 1 was the form with 4 molecules of water of crystallisation (theoretical analysis: 43.3 per cent P_2O_5, 24.9 per cent Fe_2O_3), while that from sample 2 corresponded to the modification containing 2.5 molecules of water (theoretical analysis: 48.3 per cent P_2O_5, 27.2 per cent Fe_2O_3).

Diminishing P_2O_5

In accordance with the above conclusion the content of citrate-soluble P_2O_5 in the sample of superphosphate 3 per cent (4.60 per cent) had distinctly diminished as compared with samples 1 and 2 (5.78 per cent and 7.03 per cent respectively). The content of water- and citrate-soluble Fe_2O_3 had changed in the same proportion in all samples. This must be the consequence of the transformation of a great part of citrate-soluble diphosphatoferric acid into nearly insoluble ferric phosphate. The analysis of the precipitate shows that this transformation is not complete after 1 month's storing at 70° C. as the equilibrium is attained very slowly because of the high viscosity of the liquid phase.

The percentage content of Fe_2O_3 in the liquid phase of sample 1 was more than double the content of water and citrate-soluble iron in the superphosphate itself. As the liquid phase in this superphosphate amounts to about half its weight, it becomes evident that nearly all "decomposed" iron is dissolved in the liquid phase. The liquid phase from sample 1 had a much higher content of Fe_2O_3 (7.62 per cent) than that from sample 2 (4.61 per cent). Probably the cause for this was the higher concentration of free sulphuric acid in the liquid from sample 1 as compared with that from sample 2 (7.22 per cent against 3.19 per cent H_2SO_4, see later), whereby more diphophatoferric acid was dissolved.

Supersaturation with regard to diphosphatoferric acid in the liquid phase from sample 1 cannot be assumed to be the reason, because the rapid precipitation of this compound from the liquid after its exposure to the air (oxidation of acid ferrous phosphate to disphosphatoferric acid) proves that no tendency for supersaturation exists.

In the superphosphate corresponding to sample 2, the content of citrate-soluble P_2O_5 (and Fe_2O_3) had increased during storage, while the liquid phase showed a lower content of Fe_2O_3 as compared with sample 1. The first is the consequence of a continuing decomposition of the iron oxides in the apatite during storage, while the decrease of the content of iron in the liquid phase is caused by precipitation of diphosphatoferric acid.

The nature of the compounds between trivalent iron and phosphoric acid which were found to be in equilibrium with the liquid phases of samples 1 and 2 do not seem to agree with the results obtained by former authors[9] (Fig. 1). According to these, a liquid phase containing 25.85 per cent and 30.84 per cent free phosphoric acid respectively, should, at a temperature of 40° C., be in equilibrium with ferric phosphate, and not with diphosphatoferric acid. We must, however, remember that the liquid phases in these two samples contained considerable amounts of free sulphuric acid. These were the following in the three samples examined:

Sample 1 ... 7.22 per cent free H_2SO_4
,, ... 3.19 ,, ,, ,, ,,
,, ... 0.58 ,, ,, ,, ,,

Because of the high energy of hydration of this acid its presence means an increase of the concentration of the phosphoric acid present in the liquid phase. In this way the conditions for an equilibrium with diphosphatoferric acid as a solid phase prevailed in the liquids of samples 1 and 2. Due to the higher concentration of free sulphuric acid in sample 1 the diphosphatoferric acid precipitated corresponded to the 2.5-hydrate, while the 4-hydrate was in equilibrium with the liquid phase of sample 2 which contained only less than half the amount of free sulphuric acid. In sample 3 the concentration of free sulphuric acid was very low and did not influence perceptibly the conditions for the existence of ferric phosphate which had been found to be, at a temperature of 70° C., the solid phase in equilibrium with a solution containing up to 37.43 per cent P_2O_5 $= 51.65$ per cent H_3PO_4.[10]

Importance of Free H_2SO_4

The presence of free sulphuric acid in superphosphate is evidently of decisive importance in order to keep the iron/phosphoric compounds in a citrate-soluble state.

The presence of a rather high amount of free acid, especially sulphuric acid, was also the reason why a small part of the iron was dissolved when extracting the samples of superphosphate with water. This part decreased with falling concentration of free sulphuric acid in the superphosphate. In practice, this "water-solubility" of iron compounds has no importance.

The compounds of iron with phosphoric acid, which can occur in superphosphate, therefore always cause a direct loss of P_2O_5, if the product (superphosphate) is sold on the base of water-soluble P_2O_5 only.

When the conditions in the liquid phase of superphosphate change in such a manner that crystalline ferric phosphate becomes the stable solid instead of diphosphatoferric

(Continued overleaf)

NEW CARBON BISULPHIDE PROCESS

HIGHLY reactive carbon and its conversion to carbon bisulphide form the subject of the English patent application No. 19455/1947, in the name of Gt. Lakes Carbon Corporation.

A hydrocarbon or like material is treated with sulphur at suitable temperature. Preferred materials are hydrocarbons of the type normally liquid or liquifiable at relatively low temperature, such as coal tar- or petroleum pitch, or cracked residuum, having boiling points above 175° C., and softening points at or below 200° C. The use of relatively heavy hydrocarbons of an appreciably higher unsaturated character is preferred to paraffinic and saturated hydrocarbons, since the former require less sulphur. The latter are used in liquid form and mixed in stoichiometrical proportion to the hydrogen content of the hydrocarbon to form hydrogen sulphide. Even 60 per cent of the stoichiometrical proportion is sufficient to produce yields of some 85 per cent of theoretical carbon, of which 95 per cent is convertible to carbon bisulphide.

With increasing proportions of sulphur higher yields of more reactive and readily convertible carbon are obtained. The melted sulphur and hydrocarbon material are mixed in a suitable reaction zone at temperature of 150-260° C, stirred, and the reaction mixture is further gradually heated up to 640-1000° C. to decompose sulphurous compounds into hydrogen sulphide and carbon, and volatilise the gaseous mixture distilled. Too high a hydrogen content in the reaction must be avoided.

A suitable accelerating agent may be used as in rubber vulcanisation, such as benzothiazole derivatives. The highly reactive carbon may also be used for production of calcium carbide, ferro-alloys, silicon carbide, and many other products.

IRON COMPOUNDS (*Continued from page* 699)

acid, a certain increase of water-soluble P_2O_5 occurs simultaneously with the decrease of citrate-solubility, according to :—

$$H_3[Fe(PO_4)_2] \rightleftharpoons FePO_4 + H_3PO_4.$$

This is confirmed by the analysis of samples 2 and 3 (Table 2).

Finally, it must be pointed out that the precipitates formed in the liquid phase of the superphosphate investigated never contained any calcium, even if calcium was present in those liquids which contained a low amount of sulphuric acid (see sample 3). Earlier authors[11] have expressed the opinion that the cause of a decrease of the citrate-soluble P_2O_5 in superphosphate was the formation of an insoluble calcium salt of diphosphatoferric acid, *i.e.*, $Ca[H\,Fe(Po_4)_2]$. In consequence of the results of the present investigation, this cannot be the case. A decrease of the citrate-solubility of the phosphoric acid in superphosphate containing iron is, if dicalcium phosphate cannot occur, due only to the formation of crystalline ferric phosphate.

SUMMARY.

1. The compounds of trivalent iron with phosphoric acid, which play a part in the production and application of artificial phosphatic fertilisers, especially superphosphates, are the two modifications of ferric phosphate ($FePo_4.2H_2O$) and the complex diphosphatoferric acid ($H_3[Fe(PO_4)_2]$).

2. Ferric phosphate exists in an amorphous and a crystalline modification. The first-named is precipitated from solution containing Fe... and PO_4''' ions when the *p*H of the solution is 2 and more. It crystallises under the influence of heat.

The crystalline modification of ferric phosphate can also be obtained directly from solutions of iron in phosphoric acid containing an appropriate concentration of the acid (5-35 per cent).

3. With the help of X-ray powder-diagrams it has been proved that iron triphosphate is not an iron salt of diphosphatoferric acid.

4. The amorphous modification of ferric phosphate, and diphosphatoferric acid, are highly soluble in an ammoniacal solution of citrate of ammonia (Petermann's solution), while the crystalline form of ferric phosphate is practically insoluble.

Therefore, the decrease of citrate-soluble P_2O_5 in superphosphate containing iron, as well as of citrate soluble iron bound to phosphoric acid in the soil solution, is due to the formation of crystalline ferric phosphate. This has been proved by investigation of the liquid phase in superphosphates and the solid compounds of iron with phosphoric acid in equilibrium with that liquid.

5. In superphosphates containing more than a certain amount of free sulphuric acid (in excess of about 2.5 per cent SO_3 in the liquid phase) the compound of iron with phosphoric acid in equilibrium with the liquid phase was diphosphatoferric acid with 4 or 2.5 molecules of water or crystallisation, freely soluble in a solution of citrate of ammonia.

Decreasing content of free sulphuric acid in superphosphate induces the formation of the citrate-insoluble crystalline modification of $FePO_4.2H_2O$.

Storage at elevated temperature favours the decrease of free sulphuric acid in superphosphate (attack of non-decomposed raw phosphate) and therefore the formation of crystalline citrate-insoluble ferric phosphate.

6. In order to avoid a decrease of the content of citrate-soluble P_2O_5 in superphosphates containing iron it is therefore necessary to keep the content of free sulphuric acid so high that even after a long storage at elevated temperature ferric phosphate cannot be formed.

7. The compounds of iron and phosphoric acid occurring in superphosphates are practically insoluble in water. When, however, the conditions in the liquid phase of superphosphate change in such a manner that crystalline ferric phosphate becomes the stable solid instead of diphosphatoferric acid, an increase of water-soluble P_2O_5 occurs by the liberation of 1 mol. free H_3PO_4 per mol. $FePO_4$.

8 It has been proved that no calcium salts of diphosphatoferric acid are formed in superphosphate, which formerly had been considered to be the cause of decreasing citrate solubility.

PROSPECTS OF FISCHER-TROPSCH DEVELOPMENTS

DR. C. C. HALL SURVEYS U.S. AND GERMAN PROGRESS

WHILE the production of a very wide variety of synthetic chemicals, lubricants, detergents, soaps and other products by the Fischer-Tropsch process might be an economic possibility in this country, Dr. C. C. Hall, of the Fuel Research Station, Greenwich, told the Society of Chemical Industry, Glasgow Section, he saw no prospect of the process being developed here on the scale now contemplated in the U.S.A.

Dr. Hall was speaking on " Chemical Products from the Fischer-Tropsch Process," based on extensive research work in Germany, England and America, and visits to the various plants in Germany where this process was operated during the war years.

Wax production had been in the region of 46,000 tons per annum of soft wax and 26,000 tons of hard wax. Among the very widespread uses were the impregnation of paper, treatment of textiles and incorporation in polishes. These products had been used to replace natural waxes and the refined hard wax produced would command a high price in this country.

An important feature of the process was that it provided the only satisfactory method of obtaining lubricants from coal. In Germany 20,000 tons per annum of motor lubricating oils had been produced in this way.

The possibility of producing higher alcohols either directly or *via* the "Oxo" process was a significant factor. The C_{12} to C_{14} alcohols were of particular value for the manufacture of detergents and a plant to produce 12,000 tons per annum of these alcohols by the Oxo process had been built in Germany. Oxo alcohols were generally considered to be somewhat inferior to those derived by direct synthesis. Many possibilities were, however, being explored for the further utilisation of the reaction.

Source of Soap Material

The production of fatty acids for soap manufacture had been an important feature of the work done in Germany. Owners of certain Fischer-Tropsch plants had recovered the trace of fatty acids present in the products to make soap for their own workers. The main source had been the oxidation of soft wax. Study of this synthesis had been intensified and bulk of production had gone into soap manufacturing. While no unpleasant effects had been evident when used on textiles, an unpleasant odour developed when the soap, so made, was used for toilet purposes.

The Germans had claimed that certain types used had eliminated this unfavourable effect, but even so, the reaction varied according to the individuals concerned. He cited the instance of one employee in a large plant whose acute sensitivity to these synthetic soaps made her extremely valuable to the factory as a " guinea pig."

Soap had been produced by a variety of processes and methods and by suitable combination, a considerable proportion of Fischer-Tropsch products could be converted into fatty acids. These might not be entirely acceptable to British users, but in the present acute shortage would ease supply.

Detergents

Dr. Hall covered the very considerable production of detergents by the process, stressing particularly the sulpho-chlorinated type, Mersol. While relatively inferior and strongly alkaline, it had the virtue of cheapness and was produced at a cost in the region of £38 per ton, as against prices 100 per cent greater by other methods.

He drew attention to the petroleum industry attitude that all these or similar products could be obtained from suitable fractions of petroleum and the necessity to consider the economics of the relative processes in any development as between Fischer-Tropsch and petroleum processes.

The interest created by this survey was evident in the questions raised. Dr. Hall told inquirers that while the Germans had been able to demonstrate interesting developments from the chemical engineering viewpoint, and had devised newer processes such as the Oxo synthesis they were not in advance of British chemists on the fundamental side. In some instances their experts were behind British development.

He did not think that low temperature tar or cannel could offer the same prospects as were achieved by the Fischer-Tropsch process for the products described.

Asked whether methane would offer a suitable starting point for the process, he pointed out the difficulty that in this country methane, wherever it was available, became rated on the basis of its calorific value and would be as expensive a raw material as coal. Methane gas was being used to power the sludge plants where the gas was generated, and the diversion of methane from these power units would demand its replacement by electrical, or other power.

Asked whether the German synthetic detergent product was superior to petroleum-based detergents, Dr. Hall recalled the difficulty of giving any general opinion, but stressed the excellent performance of the sulphonated primary alcohol types which could not be derived from petroleum.

GLASS IN THE LABORATORY—VIII

Bench Moulding as an Aid to Glass Blowing

by I. C. P. SMITH, B.Sc., F.R.I.C.

THE use of moulds to secure uniformity in blown glass articles when made from the furnace is universal, and as far as the chemist is concerned this applies to all such articles as beakers, flasks, bottles, measuring flasks, and cylinders, Scheibler-type vacuum dessicators, Kipps apparatus and a host of others. It is not always realised, however, that small moulds can be useful for blowing articles on the bench from tubing.

High-Temperature Needed

The moulds themselves have special characteristics which require to be studied. First, when made from cast-iron or other metal they must be heated externally, as a fairly high temperature is required in order to produce a smooth surface on the glass, and the required heat cannot be obtained from the glass, as in heavy furnace blowing practice. The metal must therefore be resistant to corrosion and to distortion on prolonged heating at temperatures approaching redness.

Such metals are available in Lunz iron, for example, a fine grain, easily worked cast iron, and in certain of the alloyed steels. They are usually made of lighter or thinner construction as the articles produced are lighter, and the moulds are not subjected to such hard use. Moulds have also been made from a hard graphite, and from wood. They are heated only by the hot glass and it is difficult to produce a nicely finished article; moreover wear is rapid.

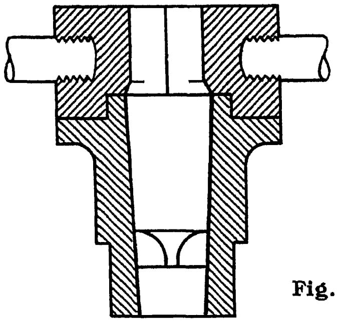

Fig. 1.

Fig. 1 shows in section a mould employed for producing the cone part of a standard ground joint. It consists of a tapered part in one piece, a stop dropped into the cone to determine the lower end, and a pair of shoulder pieces to shape the glass between the cone and the tubing; these last must open and close easily. In Fig. 2 is shown one form of set-up for ensuring this, the movement being a parallel one, the shoulders having blocks which are made to slide in suitably disposed channels by means of long levers.

Alternatively, the shoulders may be pivoted from the body of the mould, the pivot being in line with the division between the two parts of the shoulder. The mould is suitably cowled or boxed round with sheet steel covered by asbestos, so that heat from the burner underneath is carried to all parts of the mould and taken away clear of the operator by a short chimney at the back. A temperature near the lower annealing point of the glass is usually required.

Variable Stops for Cones

In producing standard cones, the stop is varied in form according to the finish required. The one shown will produce a cone which will be cut to the ordinary square open end or to an open bevel. Others will produce a rim of slightly smaller diameter than the lower end of the grinding for strength, or for joining a narrow tube to the tip; or the stop may be domed to form the slightly concave bottom of a stopper. The shoulders may likewise also be varied in shape, but must always have the first bevelled section adjacent to the cone, to determine nicely the end of the grinding.

Above this the finish may be cylindrical as in that shown to form a standard cone on a tube, or it may be given the shape of a stopper handle or an adaptor or some other form required in an apparatus. Fig. 3 shows some of the shapes which may be produced.

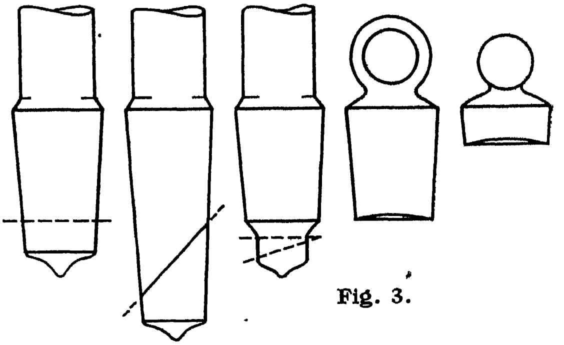

Fig. 3.

One advantage of the mould construction

in Fig. 2 is that a number of moulds of different sizes may be made to fit interchangeably in the one platform or fixture, covering a number of the standard sizes.

In Fig. 4 is shown a mould suitable for blowing a large squat weighing bottle, an article often a problem to produce in large quantities by ordinary handworking methods, owing to the large diameter of tubing required and the fact that it is frequently not truly round in section. In using the mould, smaller diameter tubing may be employed; very little size selection is required in this tubing, and a well-shaped article which is easy to grind is always produced. The finish at the top is obtained by cutting through the glass at the bead formed by the small semi-circular channel shown on the mould.

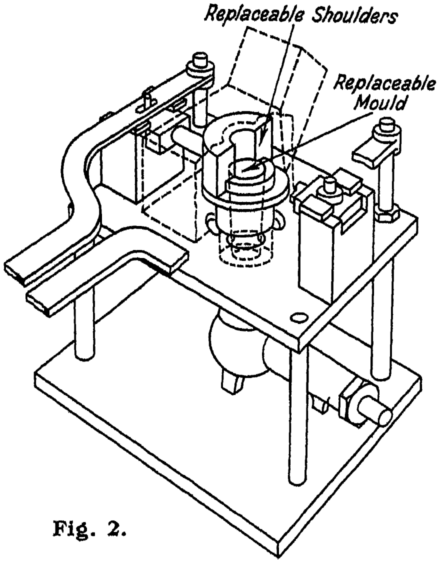

Fig. 2.

Large Stoppers

Fig. 5 shows a method of producing a large stopper, which is blown complete with a flat handle. These moulds follow closely the types used for blowing from the furnace, but are of lighter construction and provision is made, as mentioned above, for heating by means of a burner.

The operation of blowing the glass into the mould is usually one which can be mastered in a much shorter time than that required for the usual forms of scientific glass-blowing; the main reason for this is that once the worker has learned to pull good "spears" by which the glass is best handled, the manipulation of the glass is a one-handed job.

With practice, quite large billets of glass can be heated in the blowpipe flame and blown into the mould to produce a perfectly even and well-formed article. Small articles are usually blown by mouth but sometimes a lead from the compressed air supply is fixed to the end of the "spear" *via* a swivel and worked by a foot-operated valve. If the mould has been well conditioned with a layer of colloidal graphite and is maintained at a suitable temperature, a sparkling finish on the article may be obtained.

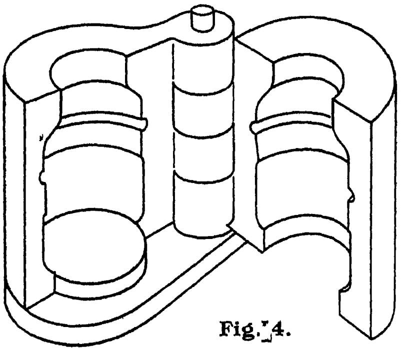

Fig. 4.

In most hand-blowing operations the glass is dropped and blown vertically into the mould, but it is possible to employ a lathe set-up in which a glass tube is rotated horizontally and heated. When at a suitable juncture, a mould carried in the tailstock is slipped over the glass and compressed air is applied to expand the glass into the mould while it is still held horizontally.

Many small articles are blown from tubing in a completely mechanical way, examples being the miniature electric light bulbs which are manufactured on multi stage machines and rely on the careful setting of numerous burners to produce the right stage of melting of the glass at the right time. For these purposes, glass is carefully selected in large batches for exact diameter and weight of wall, so that a machine will run for a long time at a given setting and produce reasonable uniformity in the result.

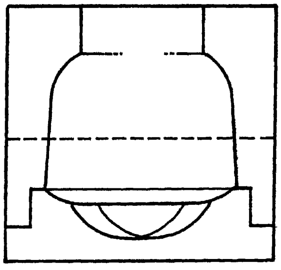

Fig. 5.

Previous articles in this series appeared on March 29, May 31, July 5, August 2, August 30, September 27, and October 25.

Figures 1, 5 and 6 in "Glass in the Laboratory—VII" were reproduced by courtesy of Messrs. A. Gallenkamp & Co., Ltd., and Fig. 8 by courtesy of Messrs. Townson & Mercer, Ltd.

LETTERS TO THE EDITOR

Survey of Scientific Man-Power

SIR,—I have recently received the above questionnaire from the Ministry of Labour. While I am wholeheartedly in favour of the compilation of such statistics, I am concerned that the established professional organisations appear to have been by passed in this matter.

Before the war the co-operation of these bodies was sought in the initiation of a Central Register, but once formed these bodies appear to have been denied any controlling interest. On the other hand the medical profession appears to have retained throughout the war an effective control in the direction and recruitment of medical men. I can see no case for differentiation between the medical profession and that of chemists.

The data now being sought is of considerable interest to the professional associations. Only a few weeks ago a similar survey was carried out by the Royal Institute of Chemistry, and like surveys have been made by the British Association of Chemists. So far as I am aware, the data compiled by the Central Register have not been made available to the bodies concerned in its initiation, nor have the records been open to inspection by them.

In my view, if these data are to be collected, it should be done through the professional bodies, and the results should be available to them. The number of chemists entitled to full membership of the two bodies mentioned is not known, as the Central Register includes many who are lacking in both training and experience. Both bodies have statistical committees who would be interested to know. If no one body exists capable of covering the whole field, it is high time chemists formed such a body, by joint action. I have inquired of both these bodies whether any such joint action is contemplated, and until I have their reply I do not propose to complete my form.—Yours truly,

H. L. HOWARD.

58 Hyde Vale, Greenwich, London, S.E.10.

"Mineral Wealth"

SIR,—As outlined under "Mineral Wealth" in THE CHEMICAL AGE of November 8, the Geological Survey Board's efforts on behalf of British minerals, constitute a matter of the utmost importance and are deserving of the highest praise.

During the past four years in particular we have publicly advocated the development of domestic barytes, in association with galena, and we are glad to note that the much overdue revival of interest in the North Pennine orefields, is at last taking more practical shape.

That there is a super-abundance of barytes awaiting exploitation in England and Scotland requires no confirmation by us. While this renewed interest should be encouraged and expanded, surely the time has passed for continuance of those old and discredited practices in use to-day, which have proved so wasteful of an otherwise valuable asset. We have, all along, stressed the urgent need for the application of modernised technology, calculated not only to increase greatly the commercial value of the raw material, but also to extend its use in home and foreign markets.

We believe the present backward position is largely due to the barytes industry being led by a limited number of technicians. We intend no reflection when we affirm our belief that an understanding of mining does not adequately replace the essential modern technical knowledge, both as regards the proper classification of the mineral lodes, and the subsequent purification of the mineral selected for economical manufacture of a valuable white finely milled powder.

Much scientific work is involved in the required preliminary investigations to be made at the source which, if suitably followed up, would bear an exceedingly good dividend, besides raising the standard of domestic barytes much above that of their foreign rivals.

To look upon barytes as the exclusive perquisite of lithopone and chemical manufacturers, to be mined and sold to them in the crude state, must, in our opinion, be adverse to both the mine owners and the national interest, whereas provided extended and systematic operations be carried out the interests of all consumers of lithopone, chemical and purified white fine ground barytes would be adequately safeguarded. Mines situated far distant from the actual consumers could become paying propositions and much increase the supply of the raw material.—Yours faithfully,

(Signed) WALTER REYNOLDS & SON.

70 High Street, Uttoxeter, Staffs.

STILL IN THE LEAD

BRITAIN leads the world in the field of communal research for industry, said Sir Arthur Fleming, Director of the Research and Education Department, Metropolitan-Vickers Electrical Co., Ltd., in the last of a series of lectures arranged by the Institute of Industrial Administration (Merseyside Centre) at Radiant House, Bold Street, Liverpool. "We are not so sure of our place in the field of pure science," said Sir Arthur. "America has gone ahead enormously in the last few years. In applied research, America is spending a good deal more money than we are, and in my view is forging ahead faster than we are."

HOME NEWS ITEMS

Benzene Explosion Verdict.—A verdict of "death by misadventure" was returned at the inquest on the three victims of the recent explosion at the London chemical works of A. Boake Roberts & Co., Ltd.

Another Blast Furnace.—A second blast furnace at Dixon's Iron Works, Glasgow, is expected to be in operation within the next few weeks and the Ministry of Supply is co-operating to obtain sufficient coke to enable the company to start.

Coal Output Progress.—Production of coal last week totalled 4,246,700 tons (4,041,000 tons from deep mines), which compares with 4,258,200 tons for the previous week. Only 23½ million tons are now required to reach the Government target of 200 millions for the year.

Sheet Steel Prospects.—Mr. J. W. Belcher, Parliamentary Secretary to the Board of Trade speaking at Erith (Kent) last week, said the shortage of sheet steel was such that only firms which can offer a good export performance are likely to get anything like the amount of steel and other materials which they would like to have.

Rubber Study Group.—A permanent secretariat in London of the Rubber Study Group has been established at Brettenham House, Lancaster Place, W.C.2, the headquarters of the London Rubber Secretariat, whose staff and offices has been taken over by the Study Group to provide national and international liaison in administrative affairs in the industry.

I.C.I. Seeking New Property.—Cheshire County Council has considered an application by Imperial Chemical Industries, Ltd., to purchase or lease Vale Royal, Northwich, which the county council acquired for police headquarters and afterwards considered using as a children's home. Both these projects have now been abandoned. The clerk of the council has been authorised to negotiate with I.C.I. for the lease or sale of the hall and approximately 10 acres of land.

Geneva Tariff Schedules.—A White Paper on the Geneva Tariff negotiations and on the General Agreement on Tariffs and Trade was published last week. Copies of the schedules giving details of the new tariff rates are now available for consultation at the Chambers of Commerce of nearly all large cities and at the following regional offices of the Federation of British Industries: Newcastle-on-Tyne, Leeds, Bradford, Sheffield, Nottingham, Leicester, Cambridge, London, Reading, Bristol, Birmingham, Manchester, Liverpool, Glasgow. Copies of the Schedules are, of course, also available at the Export Promotion Department of the Board of Trde, 35 Old Queen Street, London, S.W.1.

CELANESE DEVELOPMENTS

In his address to the 28th annual general meeting of British Celanese, Ltd., in London last week, Mr. G. H. Wigham, the chairman, said that it had always been the company's practice to follow a vigorous research and development policy, and that in the past year such a policy had been "energetically maintained" in chemicals, plastics and textiles. The programme had included increased production of cellulose acetate and other chemicals at Spondon, where it was hoped maximum planned production will be achieved by the end of next year. A plastics plant is now operating at Wrexham.

Magnesium Venture Suspended

Largely as a result of a virtual cessation of demands for additional supplies of magnesium metal by U.K. users, Imperial Smelting Corporation after consultation with the British Aluminium Company, has decided to suspend its joint plans with the Magnesium Metal Corporation to operate that organisation's carbothermic process for magnesium production. An additional consideration is that overseas demands during the next few years are not likely to provide promising outlets.

Australian Colliery Prospects

The prospect of substantial development of Australian coal mining, probably stimulated by large investment from this country, is associated with the impending flight to Brisbane of Mr. Robert Foot, of Powell Duffryn Technical Services, Ltd., to study a new coal deposit at Callide, North Queensland. Preliminary examination by the district geologist indicates that the seam here is 60 ft. thick and one part of the field of only one quarter of a sq. mile may yield 6½ million tons. Two small Australian companies have started to exploit the field, which is one of several potential sources, by open-cast methods.

Herring Oil Extraction

The Herring Industry Board is now experimenting at Yarmouth with machinery for the extraction of oil from herring by chemical reduction. This is the outcome of a visit officials of the board paid to herring oil extraction plants in Scandinavia a year ago. If successful, the result will be a very considerable increase in the production of home-produced oil, not only for human consumption, but also for use in industry, notably for linoleum and paint.

Personal

Mr. J. W. Boyle has become a director of Shell Transport and Trading Co.

Mr. James Bruce, chemical salesman, 14 Calderwood Road, Newlands, Glasgow, has left £13,727.

Mr. A. Jollie, of Coldingham, Berwickshire, a director of United Steel Companies, Sheffield left £90,115.

Mr. R. A. G. Tilney has been appointed a director of Associated Portland Cement Manufacturers, Ltd., in succession to **Mr. W. G. Chapman** who has resigned.

Mr. Arnold Petrie, of Jesmond, Newcastle-on-Tyne, area sales manager for the building products section of Imperial Chemical Industries Ltd., has died at the age of 53.

Mr. John Burke, 25-year-old clerk at the Monsanto Chemical Works, Cefn Mawr, has gained a Rockefeller Foundation award of £300 for novel-writing. He is leaving chemical industry in order to devote all his time to writing.

Dr. Hans Fluck, professor of pharmacognosy in the Faculty of Pharmacy of the Swiss Federal Technical Institute, Zurich, has been awarded the Daniel Hanbury gold medal of the Pharmaceutical Society of Great Britain for "high excellence" in drug research.

Reorganisation of the directorate of the British Coal Utilisation Research Association has resulted in the setting up of the following executive officers: Director general, **Dr. D. T. A. Townend**; director of research laboratories, **Dr. D. H. Bangham**; director of engineering laboratories, **Dr. E. G. Ritchie**; director of domestic appliance laboratories, **Mr. J. S. Hales**; secretary and finance officer, **Mr. H. T. Hathaway**.

U.S. Chemical Awards

The American Institute of Chemical Engineers has awarded the William H. Walker Award to Dr. M. Benedict and Mr. L. C. Rubin for their work on distillation. Both men were formerly employed by the M. W. Kellogg Company of New York, Dr. Benedict being well known in chemical engineering circles for his successful work on the diffusion process for concentrating uranium 235. Mr. Rubin is still the company's manager of research.

The awards are specifically related to two papers published in 1945 entitled "Extractive and Azeotropic Distillation," Part I—"Theoretical Aspects," and II—"Separation of Toluene from Paraffins by Azeotropic Distillation with Methanol."

"Metrovick" Appointments

Mr. J. Billington, the company's purchasing agent, who is to retire on December 31, will be succeeded by the contracts manager. **Mr G. T. King**, whose post will be filled by his present assistant, **Mr. H. Lawson-Jones**. Mr. Billington, Mr. King and Mr. Lawson-Jones have between them served the company for about 78 years. Since August, 1945, Mr. Billington has also been chairman of the A.E.I. Group Purchasing Committee, which co-ordinates purchasing activities throughout Associated Electrical Industries, Ltd.

Oil-Milling Machinery

HYDRAULIC press-type machinery is being replaced in France by continuous presses and expellers and by the solvent extraction process. A first and second pressing are often employed, according to oil content of seeds and nuts. The new presses recently delivered from the U.S.A. are said to be capable of removing most of the oil in one pressing; results are awaited. In the preliminary operations of cleaning, decortication, etc., among the best known French makes of apparatus are those of Terrin, Samat (Marseilles) Egrot, and Olier.

For the milling process itself, the Egrot and Olier machines (including heaters and cortification, etc., among the best-known though some American machines such as the Anderson are regarded with favour. The most commonly used extraction solvent is a "special essence distilling between 60 and 80°C." It is probably derived from petroleum. Extraction methods can be grouped under four headings, viz: fixed plant, combined plant, rotary apparatus, and continuous type (Olier, Egrot, Hansa-Muhle, Smet, and American).

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[*] From articles by Ives Bagot in *Chim et Ind.*, Aug. and Sept. 1947, and based on a paper read by the author at the Centre de Perfectionnement Technique.

Obituary

The death occurred on November 22, 1947, at Wayside, Oxted, of **Miss Emma Irene Benn**, in her 84th year, last surviving child of the Rev. Julius Benn and sister of Sir John Williams Benn, founder of Benn Brothers, Ltd. (proprietors of THE CHEMICAL AGE). Miss Benn served the firm as clerk in the early stages of its development and continued to take a keen interest in affairs, and particularly in the progress of the publishing business she had helped to found, until the last few days of her life.

Swiss Export Tax Abolished.—A Swiss Federal decree of October 31, 1947, provides that the export duty of 30 francs per quintal imposed by the decree of November 10, 1936, on copper vitriol and "fungivorous" products (No. 20 in Export Tariff) has been abolished as from November 1, 1947.

Parliamentary Topics

Soda Ash Shortage.—The distribution of soda ash supplies is under review in the light of the expanding needs of the consuming industries. There is no prospect, however, that total home production will appreciably increase until new capacity planned for 1949 comes into operation. No assurance can be given that soda ash will not be diverted into export channels because it is a valuable commodity in bilateral negotiations now proceeding with certain countries.—Mr. H. Wilson.

Harwell: "Developments Continuing."—The Minister of Supply considers that it will not be in the public interest to disclose the total estimated cost of the atomic energy research establishment at Harwell. It is not possible at present to say when the work will be completed as developments are continuing.—Mr. C. W. Key.

Exports of Oils and Fats.—The 18,000 tons of oils and fats (less than 2 per cent of U.K. consumption), which it is anticipated will have been exported by the end of the current year, will be distributed as follows: Mediterranean Colonies 6970 tons, Far East and Burma 2700 tons, Africa 1040 tons, Caribbean 595 tons, Middle East countries 815 tons, and other Colonies (including Faroes) 990 tons.—Mr. J. Strachey.

Steel Supplies.—U.S. steel producers have contracted to supply substantial quantities of steel to this country. It is not in the public interest to disclose the exact tonnages involved. Deliveries this year have averaged 16,500 tons per month.—Mr. J. Jones.

Groundnut Stocks, Nigeria.—Unshipped stocks of groundnuts in the Kano area of Nigeria on November 1, 1946, amounted to 10,000 tons. The peak stock figure was reached in February of this year when there were 208,000 tons, a figure which had dropped to 98,000 three weeks ago. During the twelve-month period ended November 1, 1947, 225,000 tons had been shipped.—Mr. Creech Jones.

Uganda Cottonseed.—Disposal of all Uganda cottonseed and its products is under Government control. All cottonseed cake is produced by local crushing, and it is exported to Kenya as cattle food.—Mr. Creech Jones.

African Phosphates.—A geological survey of phosphate deposits in Uganda has been carried out and is being studied with a view to production of fertilisers.—Mr. Creech Jones.

Industrial Subsidies.—Existing subsidies to industries include: iron and steel £7,500,000, ferro-chrome £100,000, magnesium £250,000 and aluminium £750,000.—Sir Stafford Cripps.

Next Week's Events

MONDAY, DECEMBER 1

Society of Chemical Industry (London Section). Burlington House, Piccadilly, W.1, 6 30 p.m. A. J. P. Martin: "Partition Chromatography."

Institution of the Rubber Industry (Manchester and District Section). Grand Hotel, Manchester, 6 15 p m. Annual dinner-dance.

TUESDAY, DECEMBER 2

Institute of Welding. Reynolds Hall, Manchester College of Technology, 7 p.m. H. St. G. Gardner, W. Hart, E. J. Heeley and W. L. McIvor: "Brains Trust."

Society of Dyers and Colourists (Huddersfield Section). Field's Cafe, Westgate, Huddersfield, 7.30 p.m. Dr. W. Baird: "Modern Developments in Synthetic Detergents." Scottish Section. St. Enoch Hotel, Glasgow, 7 p.m. Dr. K. W. Richmond: "Modern Trends in Hydrogen Peroxide Application."

Paint Research Association. Gas Industry House, 1, Grosvenor Place, London, W.1, 4 p.m. Annual general meeting.

WEDNESDAY, DECEMBER 3

Society of Public Analysts and The Society of Chemical Industry (Food Group). Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 7 p.m. G. E. Forstner: "The Occurrence of Metallic Contaminants in Foodstuffs"; G. W. Monier-Williams: "The Public Health Aspect of Metallic Contaminants in Foodstuffs"; W. F. J. Cuthbertson: "Trace Metals in Human Nutrition"; and N. L. Allport and D. C. Garrett: "The Estimation of Metallic Contaminants in Foodstuffs."

THURSDAY, DECEMBER 4

The Chemical Society (London Section). Burlington House, Piccadilly, W.1, 7.30 p.m. Sir Ian Heilbron: "Recent Developments in the Vitamin A Field" (Pedlar Lecture). (Nottingham Section.) Chemistry Lecture Theatre, University College, Nottingham, 6 p.m. Original papers.

FRIDAY, DECEMBER 5

Society of Chemical Industry, Chemical Society and Royal Institute of Chemistry. Lecture Hall, Albert Hall, Manchester, 6.30 p.m. Sir Wallace Akers: "The Generation of Useful Power from Atomic Energy."

SATURDAY, DECEMBER 6

Royal Institute of Chemistry. The University, Reading, 3 p.m. Professor E. A. Guggenhein: "The Atomic Nucleus."

STEEL MAKES A NEW RECORD

STEEL production in October—equivalent to an annual rate of 14,316,000 tons—was the highest of any of the monthly totals. This continues on an accelerated scale the marked improvement in steel production in recent months, which resulted in output at the rate of 13,841,000 tons in September. The rate in October a year ago was 13,226,000 tons. Pig iron production last month at the level of 8,352,000 tons annually, compared with 7,805,000 in September. The rate in October, 1946, was 8,102,000 tons.

Overseas News Items

Slow-Down.—France's aluminium production, which during the summer months was maintained at an average of 8000 tons per month, will probably be reduced by half during the winter owing to the electricity shortage.

Rubber Stocks Rising.—A marked rise in Malayan rubber stocks last month is indicated in the official figures just issued by the Malayan Government, showing total stocks on September 30 (long tons, dry weight) of 147,677, comparing with 90,418 on August 31 last.

Vancouver Pulp Mill.—A three-million dollar pulp-board plant, the first of its kind west of Ontario and Quebec is to be built in the Vancouver area. It will convert sawmill and plywood waste, now sold as pulp chips or for fuel, into soft or hard board for building purposes.

New French Fertiliser Deposits.—The exploitation has recently started at Dax, Landes Department on the Atlantic Coast of France, of extensive 12-m. potassium deposits. Production is reported to aggregate about 100 metric tons per day. The deposits are said to contain a high percentage of nitrogen, which makes them especially valuable as a fertiliser, more particularly for the growing of sugar-beet and grapes.

Danish Penicillin.—The Roskilde Medicinal Kompagni, a Danish enterprise, is at present erecting a penicillin plant. It is hoped to commence export shipments in the spring.

U.S. Sulphur Production Up.—For the third consecutive month output of U.S. native sulphur in September (406,964 long tons) surpassed the previous month's production (391,396 long tons) and established a new record. The figure for September, 1946, was 335,300.

Exports from Cyprus.—Exports of merchandise from Cyprus in 1946 (in comparison with 1945) included the following: iron pyrites 256,203 tons (100,075), asbestos 6606 tons (3445). Iron pyrites went mainly to France, Belgium and Switzerland, while asbestos was shipped to Denmark, the U.K., Eire and Jugoslavia.

Chemical Problem Competition.—The setting of a chemical engineering problem by a committee of U.S. industrial engineers presided over by Dr. Mott Souders, jr., of the Shell Development Co., of California, resulted in three students—Mr. W. J. Terrell, Mr. E. F. Macbeth, and Mr. M. E. Brooks—receiving 1st, 2nd and 3rd of the A. MacLaren White awards of the American Institute of Chemical Engineers recently. The problem concerned the design of hydrogen purification plant.

Company News

The name of **Dr. Phillips Research Corporation, Ltd.**, research chemists, 1 Angel Court, London, E.C.2, has been changed to Phillips Research Corporation, Ltd., as from November 4, 1947.

The name of **Merbart Products, Ltd.**, mineral and chemical substances, etc., 131 Victoria Street, London, S.W.1, has been changed to Merbart, Ltd., as from November 1, 1947.

Genatosan, Ltd., is maintaining its dividend at 50 per cent for the year ended June 30 last. Trading profit amounted to £100,479 compared with £151,987 for the previous year.

O. & M. Kleemann, Ltd., manufacturers of plastic goods and materials, proposes to pay a final dividend of 150 per cent, making a total of 250 per cent for the year ended August 31, 1947. Last year's total dividends amounted to 80 per cent. This year's gross profit totalled £504,587 by contrast with £265,061 in the previous year.

A majority interest in the firm of **James M. Brown, Ltd.**, manufacturers of zinc oxides, cadmium and selenium colours, oxides and salts, has been purchased by one of the Charles Tennant and Co. group of companies.

The nominal capital of **Welwyn Plastics, Ltd.** (formerly Sealite, Ltd.), Wellite Works, Woodside Road, Welwyn North, has been increased beyond the registered capital of £1000 by £24,000 in £1 ordinary shares.

The nominal capital of **Quickstryp Chemical Co., Ltd.**, 101 Morley Street, Bradford, has been increased beyond the registered capital of £4000, by £21,000, in £1 ordinary shares. On October 22, 1947, J. Manger and Son, Ltd., were allotted 17,875 fully paid shares, as consideration for certain property.

The nominal capital of **Syntics, Ltd.**, manufacturers of plastics and synthetic resins, etc., 4 Reece Mews, South Kensington, London, S.W.7, has been increased beyond the registered capital of £10,000 by £2000 in £1 6 per cent cumulative participating preference shares.

The Solvay Process Co., and **Solvay Sales Corporation** have been merged into their parent company, **Allied Chemical & Dye Corporation**, and will continue under the name of The Solvay Process Division, Allied Chemical & Dye Corporation and Solvay Sales Division, Allied Chemical & Dye Corporation respectively, with no change in personnel.

New Companies Registered

Halwood Chemicals, Ltd. (145,173).—Private company. Capital 1000 Manufacturers of and dealers in insecticides. soaps, fats, chemicals, gases, drugs, medicines, oils, colours, etc. Directors: G. J. Pritchard, J. Kendrick and P. F. Cansdale. Registered office: 6 Eldon Street, E.C.2.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

KAY (WEST END) LABORATORIES, LTD., London, N., film printers. (M., 29/11/47.) October 23, debenture to Westminster Bank Ltd., securing all moneys due or to become due to the Bank; general charge. *Nil. December 3, 1946.

THOMAS ROBINSON (MANUFACTURING CHEMISTS), LTD., Manchester. (M., 29/11/47.) October 28, £2500 (not ex.) charge, to Lloyds Bank Ltd.; charged on land and buildings thereon known as Boundary Works, Boundary Street East, Chorlton-on-Medlock.

Chemical and Allied Stocks and Shares

THE main business in stock markets again centred on industrial shares, owing partly to another batch of good dividend announcements, and partly to the encouraging turn in the coal output figures. Shares of companies expected to benefit substantially from the end of E.P.T. have been favoured, and in some cases the market is talking of improved dividends despite the doubled Profits Tax. British Funds receded, buyers holding off, pending next Monday's announcement of redemption terms in respect of the £300 millions of 3 per cent Conversion Loan.

Imperial Chemical remained active and further strengthened to 50s. 6d. and now yield slightly less than 4 per cent on the basis of last year's 10 per cent total distribution. B. Laporte were 82s. 6d., and W. J. Bush 85s.; Fisons further strengthened to 67s., and the recently-issued 4½ per cent preference to 24s. 9d., British Xylonite rose further to £7⅛, with the new shares 32s. premium, the latter having now more than doubled in price since the commencement of dealings. O. & M. Kleemann 1s. shares were also active around 33s. 1½d. following the big profit increase reported by this plastics company and the raising of the dividend from 80 per cent to 250 per cent. Elsewhere, De La Rue were better at 48s. 1½d. The units of the Distillers Co. rose to 29s. 6d., United Molasses were better at 50s. 9d., Dunlop Rubber were 77s. 9d., while British Aluminium have been firm at 19s., with Borax Consolidated deferred good at 54s. 4½d. on higher dividend hopes, British Glues & Chemicals 4s. shares came into renewed demand and rose to 23s. 9d. Greeff Chemicals 5s. shares remained firm at 15s., and William Blythe 3s. shares were again quoted at 15s. 3d. British Plaster Board 5s. ordinary were 22s. 6d., while in other directions, British Oxygen moved up to 103s. 9d.

Iron and steels have been favoured in view of their attractive yields and the up-trend in coal output. United Steel were 27s. Dorman Long 28s. 6d., Guest Keen 48s. 6d., while T. W. Ward rose further to 53s. 6d., and George Cohen strengthened to 19s. 9d. buyers being attracted by reports of the big demand for scrap metals. Allied Ironfounders rose to 57s. 9d., Babcock & Wilcox have been good at 73s. 6d., with Ruston & Hornsby 67s. 6d., Stewarts & Lloyds 56s. 6d., and Tube Investments £6⅞. In other directions, Lever & Unilever were better at 54s. 9d., Boots Drug (59s. 3d.) rallied after an earlier small decline, but Griffiths Hughes fell to 36s. 3d. following the "cut" in the interim dividend.

Helped by the very heavy application for the company's 4½ per cent preference shares (which are being issued at par) Beechams deferred have been firm at 22s. 6d. The market was impressed by the official news of continued growth in the export side of the business. Turner & Newall have risen further to 79s. 4½d., and Amalgamated Metal firmed up to 18s., while General Refractories at 22s. 6d. have been firm. Triplex Glass 10s. shares changed hands around 32s. 9d. There was again considerable activity in oil shares in view of the pending big Royal Dutch-Shell issues. Shell rallied to 78s. 1½d., Burmah Oil to 74s. 4½d., while V.O.C. were 99s. 4½d., and Wakefield touched 78s. 1½d.

Prices of British Chemical Products

STEADY markets have prevailed during the past week with a good aggregate volume of inquiries both for home account and for shipment. Consumers' delivery specifications under existing contracts have covered fair quantities, and on the production side the position appears to be a little more promising. Supplies of bichromate of soda and also chlorate, yellow prussiate, sulphide and sulphate of soda are rather tight with avaiable quantities carefully allocated, and similar conditions continue to obtain among the potash compounds. There has been a brisk demand for the white and red leads at unchanged quotations, and offers of lithopone are insufficient to meet the present demands. Barium chloride is a good market while hydrogen peroxide, bleaching powder, arsenic, formaldehyde and acetone remain in firm request. So far as prices are concerned, there have been no important changes reported, but the undertone is distinctly strong. The coal-tar products market has little of fresh interest to record. Practically all items have a ready outlet and pitch in particular is enjoying a good export demand.

MANCHESTER.—Chemical traders on the Manchester market during the past week have reported a steady flow of delivery specifications from the textile and allied trades and from other leading outlets. Home and export inquiries regarding new business have also been in evidence and these have covered the alkalis as well as the other principal heavy products, with a steady trade passing also in the lighter classes. The general tone of the market, so far as prices are concerned, is distinctly firm. There is a brisk demand for basic slag and agricultural lime in the fertiliser market, and in the tar products trade buying interest in pitch, creosote oil and the tar acids is maintained at a good level.

GLASGOW.—Conditions generally have been quiet in the Scottish chemical market during the week. Difficulties, however, are being experienced with chemicals which have been in short supply for some time, and for which the demand is increasing, due to the stepping up in the production rate of the firms using these materials. Chemicals particularly affected are bleaching powder and sodium hypochlorite. In the export market, there is also little to report, although inquiries are now coming in from Spain, as a result of the Spanish Government's policy to include chemicals in its priority import list.

Price Changes

Rises: Ammonium bicarbonate, arsenic, barium, carbonate, barium sulphate (dry blanc fixe), copper carbonate, formic acid, glycerine, lead nitrate, oxalic acid and pyridine.

Reductions: Copper sulphate, sodium nitrate and carbolic acid.

General Chemicals

Acetic Acid.—Maximum prices per ton: 80% technical, 1 ton, £56 10s.; 80% pure, 1 ton, £58 10s.; commercial glacial 1 ton £70; delivered buyers' premises in returnable barrels: £4 10s. per ton extra if packed and delivered in glass.

Acetone.—Maximum prices per ton, 1/5 tons, £86 10s.; single drums, £87 10s.; delivered buyers' premises in returnable drums or other containers having a capacity of not less than 45 gallons each. For delivery in non-returnable containers of 40/50 gallons, the maximum prices are £3 per ton higher. Deliveries of less than 10 gallons free from price control.

Alum.—Loose lump, £16 per ton, f.o.r. MANCHESTER: £16 10s.

Aluminium Sulphate.—Ex works, £11 10s. per ton d/d. MANCHESTER: £11 10s.

Ammonia, Anhydrous.—1s. 9d. to 2s. 3d. per lb.

Ammonium Bicarbonate.—MANCHESTER: £41 per ton d/d.

Ammonium Carbonate.—£42 per ton d/d in 5 cwt. casks. MANCHESTER: Powder, £43 d/d.

Ammonium Chloride.—Grey galvanising, £22 10s. per ton, in casks, ex wharf. Fine white 98%, £21 to £25 per ton. See also Salammoniac.

Ammonium Persulphate.—MANCHESTER: £5 per cwt. d/d.

Antimony Oxide.—£162 10s. per ton.

Arsenic.—Per ton, £40 5s. to £41 5s., according to quality, ex-store.

Barium Carbonate.—Precip., d/d; 2-ton lots, £24 15s. per ton, bag packing, ex works.

Barium Chloride.—98/100% prime white crystals, 4-ton lots, £19 10s. per ton, bag packing, ex works.

Barium Sulphate (Dry Blanc Fixe).—Precip., 4-ton lots, £22 per ton d/d; 2-ton lots, £24 15s. per ton.

Bleaching Powder.—Spot, 35/37%, £11 to £11 10s. per ton in casks, special terms for contract.

Borax.—Per ton for ton lots, in free 1-cwt. bags, carriage paid: Commercial, granulated, £30; crystals, £31; powdered, £31 10s.; extra fine powder, £32 10s. B.P., crystals, £39; powdered, £39 10s.;

extra fine, £40 10s. Borax glass, per ton in free 1-cwt. waterproof paper-lined bags, for home trade only, carriage paid: lump, £77; powdered, £78.

Boric Acid.—Per ton for ton lots in free 1-cwt. bags, carriage paid: Commercial, granulated, £52; crystals, £53; powdered, £54; extra fine powder, £56. B.P., crystals, £61; powder, £62; extra fine, £64.

Calcium Bisulphide.—£6 10s. to £7 10s. per ton f.o.r. London.

Calcium Chloride.—70/72% solid, £5 15s. per ton, ex store.

Charcoal, Lump.—£25 per ton, ex wharf. Granulated, £30 per ton.

Chlorine, Liquid.—£23 per ton, d/d in 16/17 cwt. drums (3-drum lots).

Chrometan.—Crystals, 5⅝d. per lb.

Chromic Acid.—1s. 10d. to 1s. 11d. per lb., less 2½%, d/d U.K.

Citric Acid.—Controlled prices per lb., d/d buyers' premises. For 5 cwt. or over, anhydrous, 1s. 6¾d., other, 1s. 5d.; 1 to 5 cwt., anhydrous, 1s. 9d., other, 1s. 7d. Higher prices for smaller quantities.

Copper Carbonate.—MANCHESTER: 1s. 8d. per lb.

Copper Oxide.—Black, powdered, about 1s. 4½d. per lb.

Copper Sulphate.—£42 10s. per ton f.o.b., less 2%, in 2 cwt. bags.

Cream of Tartar.—100 per cent., per cwt., from 201s. to 205s. per cwt. lots, d/d.

Formaldehyde.—£28 to £29 per ton in casks, according to quantity, d/d. MANCHESTER: £29 10s.

Formic Acid.—85%, £55 per ton for ton lots, carriage paid.

Glycerine.—Chemically pure, double distilled 1260 s.g., 123/1 per cwt. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

Hexamine.—Technical grade for commercial purposes, about 1s. 4d. per lb.; free-running crystals are quoted at 2s. 1d. to 2s. 3d. per lb.; carriage paid for bulk lots.

Hydrochloric Acid.—Spot, 7s. 6d. to 8s. 9d. per carboy d/d, according to purity, strength and locality.

Hydrofluoric Acid.—59/60%, about 1s. to 1s. 2d. per lb.

Hydrogen Peroxide.—1s. per lb. d/d, carboys extra and returnable.

Iodine.—Resublimed B.P., 10s. 4d. to 14s. 6d. per lb., according to quantity.

Lactic Acid.—Pale tech., £70 per ton; dark tech., £60 per ton ex works; barrels returnable.

Lead Acetate.—White, 110s. to 115s. per cwt., according to quantity.

Lead Nitrate.—About £115 per ton d/d in casks. MANCHESTER: £115.

Lead, Red.—Basic prices per ton: Genuine dry red lead, £106; orange lead, £118. Ground in oil; Red, £132; orange £144. Ready-mixed lead paint: Red, £140; orange, £152.

Lead, White.—Dry English, in 8-cwt. casks, £116 10s. per ton Ground in oil, English, in 5-cwt. casks, £141 per ton.

Litharge.—£103 10s. to £106 per ton, according to quantity.

Lithium Carbonate.—7s. 9d. per lb. net.

Magnesite.—Calcined, in bags, ex works, £18 5s.

Magnesium Chloride.—Solid (ex wharf), £27 10s. per ton.

Magnesium Sulphate.—£12 to £14 per ton.

Mercuric Chloride.—Per lb., for 2-cwt lots, 7s. 6d.; smaller quantities dearer.

Mercurous Chloride.—8s. 10d. to 9s. per lb., according to quantity.

Mercury Sulphide, Red.—Per lb., from 10s. 3d. for ton lots and over to 10s. 7d. for lots of 7 to under 30 lb.

Methylated Spirit.—Industrial 66° O.P. 100 gals., 4s. 4d. per gal.; pyridinised 64° O.P. 100 gals., 4s. 5d. per gal.

Nitric Acid.—£24 to £26 per ton, ex works

Oxalic Acid.—£110 to £121 per ton packed in free 5-cwt. casks. MANCHESTER: £5 5s. per cwt.

Paraffin Wax.—Nominal.

Phosphorus.—Red, 3s. per lb. d/d; yellow, 1s. 10d. per lb. d/d.

Potash, Caustic.—Solid, £65 10s. per ton for 1-ton lots; flake, £76 per ton for 1-ton lots. Liquid, d/d, nominal.

Potassium Bichromate. — Crystals and granular, 9⅝d per lb.; ground, 10⅝d. per lb., for not less than 6 cwt.; 1-cwt. lots, ¼d. per lb. extra.

Potassium Carbonate.—Calcined, 98/100%, £64 per ton for 1-ton lots, ex store; hydrated, £58 for 1-ton lots

Potassium Chlorate.—Imported powder and crystals, nominal

Potassium Iodide.—B.P., 8s. 8d. to 12s. per lb., according to quantity.

Potassium Nitrate.—Small granular crystals, 76s. per cwt. ex store, according to quantity.

Potassium Permanganate.—B.P., 1s. 8¼d. per lb. for 1-cwt. lots; for 3 cwt. and upwards, 1s. 8d. per lb.; technical, £7 14s. 3d. to £8 6s. 3d. per cwt., according to quantity d/d.

Potassium Prussiate.—Yellow, nominal.

Salammoniac.—First lump, spot, £48 per ton; dog-tooth crystals, £50 per ton; medium, £48 10s. per ton; fine white crystals, £21 to £25 per ton, in casks, ex store.

Salicylic Acid.—MANCHESTER: 2s. 2d. to 3s. 0d. per lb. d/d.

Soda, Caustic. — Solid 76/77%; spot, £18 4s. per ton d/d.

Sodium Acetate.—£42 per ton, ex wharf.

Sodium Bicarbonate.—Refined, spot, £11 per ton, in bags.

Sodium Bichromate.—Crystals, cake and powder, 8d. per lb.; anhydrous, 7½d. per lb., net, d/d U.K. in 7-8 cwt. casks.

Sodium Bisulphite. — Powder, 60/62%, £19 10s. per ton d/d in 2-ton lots for home trade.

Sodium Carbonate Monohydrate.—£25 per ton d/d in minimum ton lots in 2 cwt. free bags.

Sodium Chlorate.—£45 to £47 per ton.

Sodium Hyposulphite.—Pea crystals 22s. 6d. per cwt. (2 ton lots); commercial, 1-ton lots, £17 per ton carriage paid. Packing free.

Sodium Iodide.—B.P., for not less than 28 lb., 10s. 2d. per lb.

Sodium Metaphosphate (Calgon).—11d. per lb. d/d.

Sodium Metasilicate.—£18 per ton, d/d U.K. in ton lots.

Sodium Nitrite.—£22 10s. per ton.

Sodium Percarbonate.—12½% available oxygen, £7 per cwt.

Sodium Phosphate.—Di-sodium, £30 10s. per ton d/d for ton lots. Tri-sodium, £35 per ton d/d for ton lots (crystalline).

Sodium Prussiate.—9d. to 9½d. per lb. ex store.

Sodium Silicate.—£6 to £11 per ton.

Sodium Sulphate (Glauber Salt).—£8 per ton d/d.

Sodium Sulphate (Salt Cake).—Unground. Spot £4 11s. per ton d/d station in bulk MANCHESTER: £4 15s. per ton d/d station.

Sodium Sulphide. — Solid, 60/62%, spot, £22 2s. 6d. per ton, d/d, in drums; crystals, 30/32%, £15 2s. 6d. per ton, d/d, in casks.

Sodium Sulphite.—Anhydrous, £29 10s. per ton; pea crystals, £20 10s. per ton d/d station in kegs; commercial, £12 to £14 per ton d/d station in bags.

Sulphur.—Per ton for 4 tons or more, ground, £14 12s. 6d. to £16 17s. 6d., according to fineness.

Sulphuric Acid.—168° Tw., £6 2s. 8d. to £7 2s. 8d. per ton; 140° Tw., arsenic-free, £4 15s. per ton;; 140° Tw., arsenious, £4 7s. 6d. per ton. Quotations naked at sellers' works.

Tartaric Acid.—Per cwt., for 10 cwt. or more, £15 8s.; 5 to 10 cwt., £15 9s. 6d.; 2 to 5 cwt., £15 11s.; 1 to 2 cwt., £15 13s. Less than 1 cwt., 3s. 1d. to 3s. 3d. per lb. d/d, according to quantity.

Tin Oxide.—1 cwt. lots d/d £25 10s.

Zinc Oxide.—Maximum prices per ton for 2-ton lots, d/d; white seal, £68 15s.; green seal, £70 5s.; red seal, £71 5s.

Zinc Sulphate.—No quotation.

Rubber Chemicals

Antimony Sulphide.—Golden, 3s. to 4s. per lb. Crimson, 2s. 7½d. to 3s. per lb.

Arsenic Sulphide.—Yellow, 1s. 9d. per lb.

Barytes.—Best white bleached, £8 8s. 6d. per ton.

Cadmium Sulphide.—6s. to 6s. 6d. per lb.

Carbon Bisulphide.—£37 to £41 per ton, according to quality, in free returnable drums.

Carbon Black.—6d. to 8d. per lb., according to packing.

Carbon Tetrachloride.—£50 10s. to £53 10s. per ton, according to quantity.

Chromium Oxide.—Green, 2s. per lb.

India-rubber Substitutes.—White, 10 5/16d to 1s. 5¾d. per lb.; dark, 10½d. to 1s. per lb.

Lithopone.—30%, £32 17s. 6d. per ton.

Mineral Black.—£7 10s. to £10 per ton.

Mineral Rubber, "Rupron."—£20 per ton.

Sulphur Chloride.—7d. per lb.

Vegetable Lamp Black.—£49 per ton.

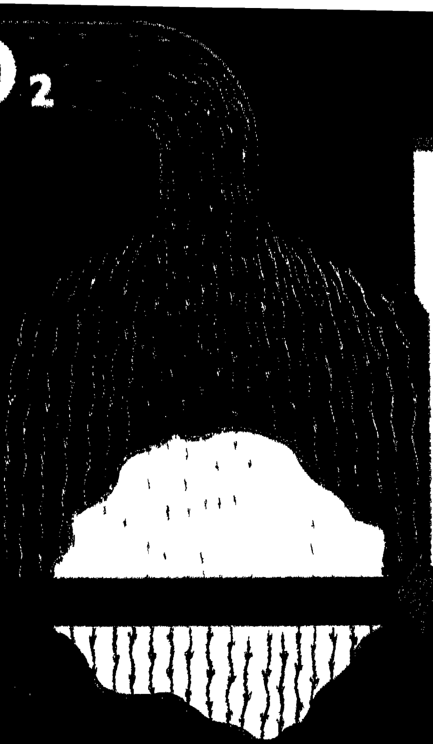
Vermilion.—Pale or deep, 15s. 6d. per lb for 7-lb. lots.

Nitrogen Fertilisers

Ammonium Phosphate.—Imported material, 11% nitrogen, 48% phosphoric acid, per ton in 6-ton lots, d/d farmer's nearest station, in December £20 4s. 6d., rising by 2s. 6d. per ton per month to March, 1947.

Ammonium Sulphate.—Per ton in 6-ton lots, d/d farmer's nearest station, in December £9 18s. 6d., rising by 1s. 6d., per ton per month to March, 1947.

Calcium Cyanamide.—Nominal; supplies very scanty.



Vanadium Catalyst

A Product of

IMPERIAL SMELTING CORPORATION LTD
37, Dover Street . London . W.1.

Concentrated Fertilisers.—Per ton d/d farmer's nearest station, I.C.I. No. 1 grade, where available, £14 18s. 6d.

"Nitro Chalk."—£9 14s. per ton in 6-ton lots, d/d farmer's nearest station.

Sodium Nitrate.—Chilean super-refined for 6-ton lots d/d nearest station, £17 5s. per ton; granulated, over 98%, £16 per ton.

Coal-Tar Products

Benzol.—Per gal. ex works: 90's, 2s. 6d.; pure, 2s. 8¼d.; nitration grade, 2s. 10½d.

Carbolic Acid.—Crystals, 11½d. per lb Crude, 60's, 3s. 6d. to 4s. MANCHESTER: Crystals, 9½d. to 11½d. per lb., d/d; crude, 4s. 3d., naked, at works.

Creosote.—Home trade, 6¼d. to 9¾d. per gal., according to quality, f.o.r. maker's works. MANCHESTER, 6¼d. to 9¾d. per gal.

Cresylic Acid.—Pale, 97%, 3s. 6d. per gal.; 99%, 4s. 2d.; 99.5/100%, 4s. 4d. American, duty free, 4s. 2d., naked at works. MANCHESTER: Pale, 99/100%, 4s. 4d. per gal.

Naphtha.—Solvent, 90/160°, 2s. 10d. per gal for 1000-gal. lots; heavy, 90/190°, 2s. 4d. per gal. for 1000-gal. lots, d/d Drums extra; higher prices for smaller lots. Controlled prices.

Naphthalene.—Crude, ton lots, in sellers' bags, £8 1s. to £12 13s. per ton according to m.p.; hot-pressed, £14 15s. to £15 14s. per ton, in bulk ex works; purified crystals, £28 to £43 5s. per ton. Controlled prices.

Pitch.—Medium, soft, home trade, 75s. to 80s. per ton f.o.r. suppliers' works; export trade, £7 10s. per ton f.o.b. suppliers' port. MANCHESTER: 77s. 6d. f.o.r.

Pyridine.—90/140°, 18s. per gal.; 90/160°, 14s. MANCHESTER: 15s. to 18s. 6d. per gal

Toluol.—Pure, 3s. 2¼d. per gal.; 90's, 2s. 4d. per gal. MANCHESTER: Pure, 3s. 2¼d. per gal. naked.

Xylol.—For 1000-gal. lots, 3s. 3½d. to 3s. 6d. per gal., according to grade, d/d

Wood Distillation Products

Calcium Acetate.—Brown, £15 per ton; grey, £22.

Methyl Acetone.—40/50%, £56 to £60 per ton.

Wood Creosote.—Unrefined, from 3s. 6d. per gal., according to boiling range.

Wood Naphtha.—Miscible, 4s. 6d. to 5s. 6d. per gal.; solvent, 5s. 6d. to 6s. 6d. per gal.

Wood Tar.—£6 to £10 per ton.

Intermediates and Dyes (Prices Nominal)

m-Cresol 98/100%.—Nominal.

o-**Cresol** 30/31° C.—Nominal.

p-**Cresol** 34/35° C.—Nominal.

Dichloraniline.—2s. 8½d. per lb.

Dinitrobenzene.—8½d. per lb.

Dinitrotoluene.—48/50° C., 9½d. per lb; 66/68° C., 1s.

p-**Nitraniline.**—2s. 5d. per lb.

Nitrobenzene.—Spot, 5½d. per lb. in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.

Nitronaphthalene.—1s. 2d. per lb.; P.G., 1s. 0½d. per lb.

o-**Toluidine.**—1s. per lb., in 8/10 cwt. drums, drums extra.

p-**Toluidine.**—2s. 2d. per lb., in casks.

m-**Xylidine Acetate.**—4s. 5d. per lb., 100%

Removing Antifriction Bearings

A more economical and time-saving method of removing large antifriction bearings from machines—in minutes instead of hours—is now being applied by an increasing number of manufacturers in Philadelphia. By pressuring oil from a hand-operated pump between the bore of the bearing and the shaft on which it is mounted, the inner ring expands and "floats" on the oil film, enabling the operator to remove the bearing with greater ease and in less time. The method introduced to industry by the ball and roller bearing firm SKF, is also successful for coupling two shafts together. The application of oil at 7000 to 8000 lb. per sq. in. reduces dismounting time to 10 or 15 minutes as compared with several hours required by the former method involving use of pullers and hydraulic jacks.

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SCOTTISH OFFICE:
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MIDLANDS OFFICE:
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Vital Capital Equipment

THE chemical industry uses as its raw material air, water, coal, salt, limestone and oil. There are, of course, other substances some of which are found in this country and others which are imported, but it is generally correct to say that the chemical industry is based very largely on indigenous materials and that the supply of raw materials is therefore reasonably satisfactory—or could be made so if everyone did his job.

The industry, however, is not based entirely on raw materials. No industry is. Process plant is the other essential and it is in this direction that the results of the present export drive are likely to be most unsatisfactory. In our anxiety for export we are equipping the world for production often to our own detriment. When the war ended the chemical industry was in a very strong position; the cumulative effect of two wars was to make of the chemical industry—neglected before 1914—one of the major industries of the country. Unfortunately, however, much of the existing plant and equipment through being overworked during the war is now worn out.

Chemical equipment wears out rather quickly because it is peculiarly subject to corrosion and to heavy wear and tear. Moreover, it is inevitable that a fairly high proportion of the chemical plant which was installed in or before 1939 should by now require modernisation as new processes and new methods of construction have been developed.

The modernisation of chemical plant is the source of a great deal of anxiety at the present time. Not only must we modernise existing processes, but we require to put into practice many research results which could not be brought to development during the war. Mr. J. Davidson Pratt in an address to the General Committee of the Parliamentary and Scientific Committee has pointed out that many millions of pounds are now being spent on schemes for the development of the chemical industry, but that these developments are being seriously retarded through difficulties in the supply of coal and steel and through lack of building facilities, plant and so forth. He added "Many in the industry feel that at the present time, when there is imperative need to re-equip our own industries, it is a great pity that plant should be sent overseas to equip other industries that would become our competitors." This view has lately been underlined by Mr. R. M. Shone, Economic Director of the British Iron and Steel Federation.

Now the re-equipment of our industries has received a further setback through the Government's brake on capital expenditure. The Government wants to see a reduction of £180 million in capital expenditure at home; other views are that capital expenditure should be cut by upwards of £500 million. First indications provided in the White Paper which the Chancellor of the Exchequer presented to Parliament on Monday show that the restriction will press heavily upon the chemical and associated industries, largely because of the proposal to transfer to the export market £72 million worth of material, against the current estimated total of £40 million a year, which will completely negative any benefit which might accrue from the planned increase of

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total production from £110 million to £121 million in 1948. This and the severe limitation proposed of building plans cannot fail to have serious results. That policy has been condemned by Mr. Shone and by hundreds like him. He says: "There is a serious danger that the cutting of capital expenditure may be looked upon as the main line of attack on our problems and may lead to an enthusiastic cutting away and sacrificing of projects which are vital to improving the fundamental economic position of the country." He gives, too, the timely reminder that some observers, particularly Americans, have expressed the opinion that the real need in this country is for a still more aggressive policy of modernisation and re-equipment of our industries.

The present modernisation of the iron and steel industry is an example of the advantage of spending money on capital plant, which the chemical industry would do well to emulate. The modernisation of the iron and steel industry shows an average gross return on capital of just over 20 per cent per annum as compared with the costs at the plant replaced. This would of course be reflected in reduced prices.

Taking the figure of benefit from these capital expenditures on the conservative basis of 20 per cent per annum, it may be calculated that 100 units of labour and resources devoted to the scheme would yield a return of 20 units per annum over the life of the plant, say over 20/25 years. The aggregation of the return over a life of 20 years gives 400 units for the 100 units of labour and materials initially expended.

Further developments in this and other industries would, moreover, enable the process to continue so that in fact the return should well be measured on a compound interest basis. The corollary to that, says Mr. Shone, is that, "if all the resources so released could be re-invested to give the same gross return of 20 per cent, the 100 units of outlay would yield an aggregate return of 8700 units over the 20 years' life of the plant. This may be an extreme case and the rate of return from future developments may not be so great. But it does serve to illustrate the vast surplus, far exceeding the original outlay, that is yielded by industrial capital development and which makes it so vital to take full advantage of the most productive openings of this type." We strongly recommend those views to Sir Stafford Cripps.

Quantum Chemistry Course

Commencing on Tuesday, February 6, 1948, a course of six lectures on "Quantum Chemistry" is to be held at the Sir John Cass Technical Institute, Jewry Street, E.C.3. Post-graduate and advanced students are invited to enrol. The lecturer will be Prof. H. S. W. Massey, and the syllabus is as follows: (1) Electronic Structure of Atoms according to Quantum Theory; (2) Quantum Picture of the Simplest Molecules—the new Interpretation of Valency; (3) Quantum Theory and Organic Chemistry; (4) Theory of Metals; (5) Nature of Crystal Binding—Electrode Phenomena; (6) Nuclear Structure.

NOTES AND COMMENTS

Opportunity

FIRST impressions of the amended schedule of United States Import Duties implementing the Geneva Agreement might justify the belief that one of the primary objects of the international accord was to facilitate chemical trading. Of the seven pages of small type in which the *Board of Trade Journal* presents the first instalment of the reduced tariff items three pages relate almost entirely to chemicals, and chemical and allied products figure here and there in the remaining pages. The reductions in import charges are sweeping, in most cases representing a relief of 50 per cent and of 33⅓ per cent in others, sufficient in fact to tip the scales decisively in favour of the British export trader *who can supply the commodities now*. For the moment the italicised words are the operative ones. It can be said at least that a large proportion of the items are those for which British manufacturers sought reliefs in consultation with the Board of Trade when the Geneva Agreement was being negotiated, and thus are included many chemicals, as for instance naphthalene and cresylic acid, which will find a ready market in the U.S.A. for any country which can supply them and, equally essential, can muster the containers in which to ship them. In the present state of the home market there is very little prospect that the agreement can confer any large benefit immediately. Nevertheless, it represents the lever by which the door to golden opportunities may be opened by the countries which succeed first in revitalising their chemical export industries. The moral is obvious. Equally obvious is the obligation which it lays upon Government departments to aid the flow of material and plant for chemical industry by all means in their power.

Welding Progress

AMID the current preoccupation with what renders an industry "essential," with its contingent claims to priority in material and labour supplies, the welders, one would say, are at the moment in a very strong position. In the industrial counterpart of the current domestic mend-and-make-do economy the welding industry is equivalent to the needle and thread; and recently, thanks to the fundamental progress achieved by the scientific study of metals and of welding and inspection plants, the industry has abundantly proved its ability to provide at short notice renovations and adaptations comparable in every respect with new construction. The value of such a service while current material shortages continue is self evident. A summary of some of the advantages which it can now confer appears in the Metallurgical Section of this issue and the prospect of continued widening of technique seems assured by the very progressive spirit which animates the British Welding Research Association—the cost of whose programme in the past 18 months has overrun its very substantial income. An embarrassment at the moment is that the field is too wide: welding is in fact too versatile even for the considerable research organisation that has been built up. The association, as Sir William J. Larke, its president lately announced, is obliged now to reorganise and concentrate its research programme. While the policy at present is almost certain to produce a fuller flow of tangible results in chosen fields, a substantial addition to the association's finances to permit the widest activity would seem to be a good investment for industry as a whole.

Free Scientists

THE growing recognition by the powers that be that the scientist is an indispensable ally in most plans for economic betterment—the subject of our leading article last week—was underlined by Sir Robert Robinson in his presidential address at Monday's anniversary meeting of the Royal Society as being sufficiently important to merit mention as one of the significant trends of the year. Mentioning the comparatively recent creation of the two advisory committees to the Cabinet, the Advisory Council on Scientific Policy and the earlier Defence Research Policy Committee, Sir Robert admitted that while these bodies represented the success in peace-time of an insistent demand in the war years for scientific consultation at the highest level, the consummation had nevertheless evoked some uneasiness. Freedom of research and planning and control might not be in harmony. Those who have shared that suspicion, and they are not few, will have been reassured by Sir

Robert's declaration that, apart from the subtle effects of selective encouragement, "a danger which could hardly be avoided," he was not apprehensive that the dead hand of officialdom was going to stifle scientific progress. Sir Stafford Cripps, he recalled, had already declared his faith in the independent bodies as the competent media for real encouragement of pure research, and there was every reason to think that the Government as a whole realised the vital importance of untrammelled research. Few can have greater interest than Sir Robert Robinson in preserving the liberty and initiative of the research worker. His conclusion therefore should go far to set many minds at rest. "We have not surrendered the power to take the initiative, and we retain the traditional privilege of access to authority. Our public usefulness depends therefore on our own ability to suggest and promote action and we have even gained potential for independent leadership."

"Merit" Payments

THE principle of evaluation of wage rates on a points basis in an integrated wages structure was widely canvassed here some months ago and the subject fairly certainly has not been entirely discarded, although economic urgencies of another kind have swept it out of view. Meanwhile, it is worth noting that in one other country an approach of a somewhat similar kind to the same problem is being made. In Czechoslovakia social and economic factors admittedly differ too widely from their counterparts here for a direct parallel to be drawn, but the uniform system of wages on a "merit" basis now being instituted there is not without interest. The system has already been adapted to the metallurgical industries. Some details were given recently by K. Stastny in the Czechoslovakian metallurgical journal, *Hutnicke listy*. The basis of the system is the standard of education and training of the worker, the kind and amount of work done, and the effort made. For some sections of the metallurgical industries there are eight classes; but with foundrymen and smiths there are nine classes owing to the specially hard work involved. The classification generally is reviewed, with examples, and a table of wages made up on the new system for both piece workers and time workers is now in operation.

U.S. HAS NEW ANTI-MALARIAL DRUG

IN an address to the Western New York Section of the American Chemical Society at Buffalo, New York, recently, Dr. R. C. Elderfield, Professor of Chemistry at Columbia University, announced that a new anti-malarial drug which, when used with quinine, is capable of effecting cures in 95 per cent of all malaria relapse cases, had passed all clinical tests and was practically ready for commercial production. Subsequently, the significance of the professor's statement has been diminished by an announcement in a business magazine that America's supply of cinchona bark is heading towards a state of critical shortage since the bark is the source of quinine and quinidine, without which millions of people suffering from malaria and heart ailments cannot carry on normal lives.

The new drug is 6-methoxy-8(4-isopropylamino 1 methylbutylamino)-quinoline, and is identified by the number SN 13,274. It was first synthesised in Columbia University's Chemistry Department in October, 1945, when the department was working under an anti-malarial contract with the U.S. Office of Scientific Research and Development. (THE CHEMICAL AGE, October 18, page 549.) The greatest problem was to discover a drug that would reduce toxicity as much as possible. Until the present discovery, pentoquin was considered the best of the anti-malarial drugs and was a great improvement over the German drug plasmochin, which was regarded as too toxic to be of much use. Columbia University has continued its work in developing more practical ways of producing the new drug and is exploring related compounds.

The cinchona shortage is attributed to the three following factors:—

(1) The Dutch, who have controlled the world cinchona supply for 100 years, announce they have regained 90 per cent of the Javanese cinchona plantations over-run by the Japanese during the war (Indonesians hold the rest). To American buyers, this means that the Dutch cartel has returned.

(2) The U.S. Government is preparing to end most of its controls over quinine, quinidine and bark on February 29, turning the U.S. trade back to private enterprise. The Government will, however, hold an emergency reserve of 1.2 million ozs.

(3) The U.S. Government is reported to be ceasing to purchase cinchona from Central America, whence supplies have been obtained ever since the Japanese captured Java.

River Pollution Charge

Potassium Cyanide

THE emptying of a tank containing 180 gal. of potassium cyanide into the River Seiont recently, had its sequel at Caernarvon on November 29, when Mr. T. Catterall, factory manager to Hunting Aviation, Ltd., was summoned for poisoning the river waters. It was stated that Mr. Catterall's act had destroyed 600 fish, and from the point of introduction (the company's Peblig Mills) to the sea, marine life was extinct. The defence was that the tank was thought to have contained water. A verdict of "guilty" was returned, and fines to be imposed will be announced at a subsequent session of the court.

Waste Treatment: U.S. Forcast

The growth of American industry has rapidly increased the problems of waste disposal and stream pollution. Surveying existing waste disposal laws in the United States at the American Institute of Chemical Engineers' fortieth annualy meeting in Detroit, Mr. Anthony Anable and Mr. R. P. Kite, of the Dorr Company, stated that almost all States have tended toward increasing restrictions, and conclude that existing violations will be prevented. They state that " the future waste treatment plant will be designed and built simultaneously with the major plant, and regarded as important an operating element as any other plant process."

Waning Power of Penicillin

The power of penicillin over grave staphylococcal infections is already well on the wane and we must look to a future in which the problem of treating these infections has almost to be faced afresh. This consummation of what was earlier predicted by medical scientists is noted by the *British Medical Journal*, which adds that penicillin resistant staphylococci are encountered with increasing frequency, and the present enormous consumption of penicillin can be accounted for only by much indiscriminate use.

Amendment of Insurance Act Sought.—The General Federation of Trade Unions, representing some 300,000 skilled craft workers in a variety of industries, is appealing to the Ministry of Labour to make changes in the National Insurance Act relating to unemployment benefits. The Federation is asking for restoration of the provision under which unemployment benefit was payable to workers involved in a stoppage "due to an employer acting in a manner so as to contravene the terms or provisions of an agreement to which the employers and employees are contracting parties."

Capital Expenditure Cuts

Less Building and Machinery Next Year

"TO bring the volume of new investment undertaken into proper relation with the reduced supplies of materials, industrial capacity, and man-power that we can afford to make available for this purpose," the Government has announced this week in a White Paper, " Capital Investment in 1948," its intention to bring about a reduction of capital expenditure of £180 million below the estimated total of £1600 million. All phases of national development, including State enterprises, have been marked down for more or less drastic reductions and first indications are that future industrial building, excepting those schemes which have already been assured of material permits and also certain specified industries, will be discouraged.

In the matter of modernisation and replacement of industrial plant, the proposals of the White Paper foreshadow intensified difficulties. Its proposals for plant and machinery are that total production, now running at £110 million a year, shall be increased to a rate of £121 million by the end of 1948. Current exports of £45 million will be raised to £72 million. This and other changes will transfer production represented by 60,000 tons of steel a year from the home market to export.

Plant investment is divided into three categories, by State industries, public authorities and private industries. It is admitted that, short of reintroducing a system of individual licences to acquire plant and machinery, there is no possible method of detailed control of private investment.

While the export quotas set for machinery will automatically limit such expenditure, this by itself may not be fully effective in restraining the volume of investment attempted. There is a danger that exports or important home needs may be prejudiced by the pressure of demand for certain products for less essential purposes.

" The Government," says the White Paper, " are reluctant to reintroduce licences to acquire on a large scale and will, therefore, rely for the present on the good sense of private industry following a policy lead." The matter will be the subject of conferences with the appropriate industrial organisations.

Argentine Linseed

It is reported from Argentina that only 4,000,000 acres are under cultivation for linseed this year. From this acreage a crop of no more than a million tons is expected. Last year, 4,698,000 acres were planted. There has been a noticeable decline in the republic's linseed production each year since 1939 when 7½ million acres were under cultivation.

Growth of Gas Research

Synthesis & Hydrogen Sulphide Recovery

THE widening of the scale of research originated by The Institution of Gas Engineers was manifest at the institution's autumn research meetings in London last week, in the course of which Dr. H. Hollings, chairman of the council of the Gas Research Board, reviewed current investigations.

Because of the increased size and importance of this work, which is rapidly absorbing all surplus income, several small panels of experts have been set up to advise on specialised aspects of scientific research being undertaken.

Pressure Gasification

Dr. Hollings reported :—

" The work on the gasification of coal under pressure is proceeding at Bournemouth. It will be remembered that the original pressure vessel was designed for a study of the hydrogenation of coal. On the advice of the panel which has this work under review, the council is now considering the practicability of obtaining a new pressure vessel designed primarily for a study of the behaviour of various bituminous coals when gasified under different pressures of steam and air.

" An order has been placed for a small water gas generator specially designed for operation with a preheated air blast. The trials to be made as soon as this plant is available should indicate the practicability or otherwise of obtaining higher thermal efficiencies which several calculations in recent years have shown to be possible in water gas manufacture.

" It is probable that within a few months the programme of work on methane synthesis will have reached a stage at which we can present a final report. The large scale trials of catalysts at Bournemouth are proceeding very satisfactorily and if we can suspend this work pending some industrial development of the process we can release staff for other work.

" The new programme concerned with the removal of hydrogen sulphide from gas has made a very promising start. With the generous help of the Bournemouth Gas Company we are securing additional laboratory space at Bournemouth and the programme of work remitted to the staff stationed there is being extended."

Oil from South African Coal.—A plant for the extraction of oil from coal is being erected in South Africa, and will incorporate the most up-to-date U.S. features. Within about three years it is planned to produce 60 million gallons of petrol and 9 million gallons of diesel oil, according to Mr. Hersov, chairman of Anglo-Transvaal Consolidated Investment Company.

Government Purchasing

Medical and Scientific Supplies

FROM December 1 the Ministry of Health has taken over from the Ministry of Supply general responsibility for purchasing medical supplies to meet Government requirements. The change-over is effected under the Transfer of Functions (Medical Supplies) Order, 1947, published last week. It involves the transfer to the Ministry of Health of the functions, responsibilities and staff of the Directorate of Medical Supplies, including those of the Penicillin Production Control and the related Contracts Branch of the Ministry of Supply.

All correspondence which was formerly addressed to the Directorate of Medical Supplies should be addressed to the Secretary, Ministry of Health, Whitehall, S.W.1. The telephone number (Abbey 7788) remains unchanged, and the new telegraphic address will be " Localise, Parl, London."

The functions transferred include the purchase and inspection of Government requirements of drugs, dressings, and medical and surgical equipment, and responsibility for sponsorship of firms producing these supplies for civil needs.

The purchase of Government requirements of scientific glassware (furnace blown, pressed and lamp blown), laboratory apparatus and equipment, laboratory porcelain and liquid-in-glass thermometers (other than clinical thermometers) now becomes the responsibility of the Ministry of Health. The executive functions of sponsorship of the industries and firms manufacturing these products (*e.g.*, allocation of materials, consideration of building licence applications, labour questions, etc.), will in future be exercised by the Director of Instrument Production, Ministry of Supply, 18-24 Hyde Park Street, W.2 (Telephone—Ambassador 1290).

NIGERIA TO HAVE UNIVERSITY

A UNIVERSITY College is to be established at Ibadan, Nigeria. A five-acre site has been acquired and surveyed, and an architect is to be appointed immediately to plan the permanent buildings. The only appointment so far confirmed is that of the principal—Dr. K. Mellanby—who is already in Nigeria. Professorial staff for the various departments including that of chemistry are shortly to be appointed. There is already in existence a higher college at Yaba, and the staff and student body of this college is to form the nucleus of the University. THE CHEMICAL AGE is informed that by the end of 1949, the project will have taken practical shape, and that research and development work in connection with organic chemistry will be well under way.

Reforming the Law of Negligence

Proposed Removal of Anomalies

LAST week saw the publication of the Law Reform (Personal Injuries) Bill. It is largely based on the report of the Monckton Committee, which was set up to consider among other things the changes in the law affecting personal injuries which would be necessary if the proposals of the Beveridge report were carried into law.

The Law Officers are to be congratulated on their promptitude in proposing legislation. The law of negligence must adapt itself to modern conditions, especially changing methods of work. In the past there has been great reluctance to amend the law, even where it was obviously unfair or out of date. This new measure, together with the Contributory Negligence Act 1945 and the Crown Proceedings Act, 1947, does much to improve this branch of law.

Reform Overdue

The iniquitous doctrine of common employment will now in all probability be interred—rather belatedly. The remarkable thing is that it has survived for so long. It has been universally condemned for many years and the Courts have done their best to whittle it down. It lays down that a workman may not claim against his employer for injury caused to him by the negligence of a fellow employee; the reason given for this was that a workman was presumed to agree to undergo the risk of injury by a fellow employee, a legal fiction in no way related to reality.

Much hardship also has been caused by the doctrine of election, which applied where a workman had two possible remedies against his employer, either under the common law or under the Workmen's Compensation Acts. A workman who, in the full knowledge of his rights, accepts workmen's compensation, disbars himself from suing at common law. It has often been pointed out that this is a great hardship on the workman who, in urgent need of money, may not be able to await the result of an action at common law. Certain unscrupulous insurers had developed a practice of offering a prompt payment of workmen's compensation, in order to defeat the common law rights. But this was effectively stopped by a decision of the House of Lords some 18 months ago, that an action at common law is barred only by the acceptance of compensation, where the workman accepts compensation in the full knowledge of his legal rights.

The passage of the National Insurance (Industrial Injuries) Act, 1946, compelled a reconsideration of this doctrine. The substitution of state insurance for workmen's compensation struck at the whole basis of election, as the worker no longer had alternative remedies against his employer. The question now arose as to whether he should get both insurance benefit and damages, or whether the benefit should be deducted from damages. A majority of the Monckton Committee favoured the latter course. The new Bill is a typically English compromise. It provides that one-half of the insurance benefit which is likely to become due within five years of the accident, shall be deducted from damages. Widows and the permanently disabled, who are likely to receive benefit for a great deal longer than five years, will benefit considerably from this compromise. In assessing the benefit no account is to be taken of the increased pension payable to a person who required constant attendance. Medical expenses are to be allowed, where a person has employed a doctor instead of making use of the free services provided by the National Health Acts.

Unreasonable Ruling

One section of the Bill gives relief to the employer. At present he is liable to an employee who is injured by reason of the employer's breach of some statutory duty, usually imposed by the Factories Act or the regulations issued under it. The Factories Act imposes an absolute obligation and an employer will not be excused for a breach however good his excuses may be. It will now be a defence for the employer to show that it was not reasonably practicable to avoid or prevent the breach which caused injury or death.

The new Bill will apply over the widest field. It binds the Crown, thus covering Government employees and covers all forms of injury, including purely mental injury and impairment of health.

U.S. SYNTHETIC FUELS

AMERICAN petroleum requirements before the war were around 4 million barrels a day; in war they were 5 million barrels and are now 5.5 million barrels. This, in conjunction with dwindling resources—says Mr. W. C. Schroeder, chief of the U.S. Office of Synthetic Liquid Fuels —makes it additionally necessary to expedite the economical production of petroleum from natural gas, coal and some other sources. Coal, of which the U.S. contained probably 50 per cent of the world supply, was the most obvious source of all kinds of fuels, from the highest octane spirit to heavy oils. Two million barrels of synthetic fuel daily requires an investment of $8-9 million and probably 15 million tons of steel.

Plastic Protective Coatings

Some Useful Applications of the Flame-Spraying Method

ATTENTION was drawn in a recent article to the frequency with which it is necessary to resort to traditionally protective materials such as earthenware, wood and lead, in providing exhausting equipment for corrosive and noxious fumes. A comparatively recent development, namely, the flame-spraying of plastics, offers a range of interesting and valuable possibilities which deserve study. Hitherto the application of plastics to plant and vessels has been by painted or air-sprayed solutions, or affixing of the plastic in sheet form.

The use of solutions of plastic in solvent is not always satisfactory because of the comparatively low solubility of the higher polymers in the commercially applicable solvents, resulting in thin coating and in the necessity of drying and eliminating the solvent. The use of plastics in sheet form is a relatively long and expensive process.

Simple Process

The flame spraying of plastics on the other hand is a recent development whereby the material is passed through an oxy-acetylene or oxy-propane flame, softened and melted and so coated in a fused and homogeneous layer on any desired surface. The surface can be metal, wood, stone or stoneware, brick, asbestos board, in fact almost any constructional material.

In flame spraying, the most suitable plastic for the particular process or requirement is chosen and the thickness of coating is wholly under the control of the sprayer. The spraying is carried out with a flame spraying pistol, by a process evolved in this country during the last few years by the Schori Metallising Process, Ltd., London, N.W.10, the pistol being the Schlori powder pistol.

An important characteristic of all the plastics sprayed by this method is that they are all waterproof and for the most part very inert to all the usual chemical vapours; the newer plastics such as polythene, the polyvinyls, acrylic and styrene plastics are in fact some of the most inert materials known in the chemical world. Moreover, many of them also have outstanding di-electric properties and so can play a dual part as protectors against violent corrosive attack and are first-class electric insulators.

The fact that these coatings are flame sprayed at once eliminates one of the troubles of painting, namely, the necessity for drying, and in some cases, eliminates solvent vapours. Spraying, which can be carried out either before plant is assembled, or *in situ*, calls for preparation of the same order as painting, but the heat of the fused sprayed coat, and the fact that no solvent or vehicle is present, means that with all but one plastic, the sprayed coat is dry and ready for use as soon as the coat is cool, that is in a minute or two. This is a very valuable advantage.

The exception is Thiokol, a valuable synthetic rubber, in powder form, which is not only highly resistant to almost all chemical fumes, but provides an elastic, resilient coat which withstands a tremendous amount of impact from solid particles carried along in a powerful air-stream.

A thick coating of about ⅛ in. of Thiokol on steel plates has been used successfully to protect the walls of shot-blasting cabinets against the continuous stream of chilled iron grit used to clean and prepare metal surfaces for spraying. It is the only sprayed plastic which remains tacky for some hours after spraying.

The spray pistol is simple to handle, having no moving parts beyond three simple valves controlling the air and gas. The powder is impelled by compressed air, generally at pressures between 10 and 20 lb./sq. in. and the combustible gas can be acetylene or a soft gas such as propane, the latter preferably, as plastics do not require too intense a flame.

Air Pressure Control Important

Oxygen is used at a pressure of 25 lb./sq. in. and the propane at 9 lb. Control of the air pressure is an important part of the "know how" as it regulates the correct fusing of the plastic upon which the successful spraying of plastics depends. Hence while the pressures of oxygen and propane, or other gas, are regulated once and for all at the commencement of spraying, the air is regulated to ensure that there shall be no over-heating, and that the fusing of the plastic coat shall be completed.

The surface to be sprayed must be clean and entirely free from dust, rust, scale, etc. In the case of metal it is the rule to shot blast before spraying as this ensures a perfectly clean metal surface and a mechanical key for the plastic also. In the case of the light metals, aluminium and light metal alloys, the shot blasting can be dispensed with and that applies to many non-metallic substances such as wood, asbestos board, slate, stone.

The rate of spraying depends upon the thickness of coating to be applied. In the case of most plastics, thickness of coat ranges from a few thousandths of an inch to ⅛ in., the thickness depending upon the duty the coating will be called upon to give.

Sprayed plastics may be used to protect the interior walls of chambers or ducts, to cover the blades and hubs of impellors or fans, also metal gates or dampers; they must not be used where temperatures above 60° C. are involved as above that temperature their resistance to various agents is lowered and they may begin to soften. That at present is a drawback to their wide application, but it should not be long before other plastics are available having softening points very much higher than 80-100° C. In fact, the chemist already promises plastics having softening points up to 150° C. and there have been indications that we may expect materials having resistance to chemicals at present unequalled and a softening point as high as 350° C. For the moment these statements emanate from the U.S.A. but we do not usually lag far behind in development.

A specific application of polythene has been in the coating of mechanical stirrers for mixtures and solutions of a highly corrosive character. Another analogous application is the treating of stirrers used in electrolytic cells; here the polythene acts as an electric insulator as well as protection Mention may be made of a developing use of polythene coating in the electro-plating industry where the coating of jigs and hangers has put an end to the loss of metal through the plating of these components, and resulted in notable economies in the plating shops.

In both the chemical and electrical industries a simple method of testing for pinholes in coating of polythene on metals is essential. The method used by the Schori Laboratories is simple and efficient. Two 240-volt high tension batteries are connected in series through a resistance of a quarter of a million ohms to a milliammeter and thence to a brush—an ordinary fairly soft bristle brush—the other terminal being to a metal clip which is attached to an uncoated spot on the coated metal to be tested. The electrolyte used is tap water and the brush is wetted and passed over the coated surface. A pinhole or the like will be marked and the faults rectified by a refusion at the point where the defect occurs.

Ebonite and Elementary Sulphur

For the moment the choice of a protective against acid fumes, even including hydrofluoric and the strong mineral acids, so long as they are below 60° C. lies with polythene, with Thiokol second. Not only have these plastics been used for ducts, fans and chambers, but also for coating the interior of reaction vessels. Polythene has proved very successful in this direction.

An ancillary application of the flame spraying technique of interest to many chemical engineers is the possibility of spraying ebonite. This is as yet hardly past the experimental stage, but some promising results have been attained.

German Metallurgy

Information on the composition and thermal and magnetic properties of "Thermoperm," a complex type of nickel steel used in Germany as a temperature compensating device in the construction of magnetic tachometers; tantalum production by Siemens and Halske in Germany and technical data on various types of heat resisting alloys considered or used in fabricating turbine blades for gas turbines and jet engines in Germany are contained in the latest reports by the U.S. Office of Technical Services, Department of Commerce, Washington.

Evidence of the versatility of such impervious plastic coatings: a representative selection of industrial ventilating and other equipment recently given enduring protection by this method

Italian Chemical Notes

From our Rome Correspondent

THE Egyptian Government is reported to be negotiating for the purchase of the Italian-owned Egyptian Company for Production and Trade in Phosphates, which was founded in 1912. Most of the shares were originally held by the Bank of Rome, which later transferred them to the Italian Government. The minority shares have remained in Egyptian hands. The company owns two calcium phosphate mines—at Djebel Duwy and Djebel Hamandat. They are connected by a short railway line with the port of El Kosseir on the Red Sea. Although Moroccan phosphates are purer (80-85 per cent) than the Egyptian (72 per cent), it is often more profitable to accept slightly inferior phosphates than to pay the Suez Canal passage duty to which the Moroccan variety is subject. As Italy owes £4,500,000 reparations to Egypt, it is probable that the Egyptian Government will succeed in inducing Italians to sell

* * *

Although output of the principal acids such as nitric, sulphuric and hydrochloric, is satisfactory, it is difficult to predict a continuance of this state of affairs throughout the winter. Oxygen required by the metallurgical industry may be in short supply due to restricted use of electricity, though some factories now operate their own generating units. Some concerns have found themselves in financial difficulties owing to the recent restrictions in banking credits. Others find it difficult to pay the now surplus personnel which they are not allowed too dismiss. In this sense the factories making explosives are the worst off. Their output is nowhere near the war-time level, yet they are obliged by law to retain the large numbers of employees acquired during the years 1938-42.

* * *

The situation of Italian soap industry has improved considerably because many of its raw materials have been reduced in price, and the market readily absorbs the entire output. Nevertheless, it remains true that this industry is working only at about one-third of its total capacity owing to the shortage of vegetable and animal fats. In 1939 Italian soap industry consumed about 160,000 tons of fats, 83,000 tons of which had to be imported. This year the industry had to be content with 36,000 tons produced locally.

* * *

The Italian Ministry of Foreign Trade in agreement with the Ministry of Industry and Trade, has decided to ban imports of fluoridic acid because it is felt that home production is sufficient for the needs of the country.

Helium from Natural Gas

Low Temperature Process

EXPERIENCE gained in the low temperature production of helium from natural gas is helping U.S. chemical engineers to design new plants important to the country's economy. This is the opinion of Dr. P. V. Mullins, of the U.S. Bureau of Mines, expressed in a paper read recently before a meeting of the American Institute of Chemical Engineers. The plants are in the low-temperature industries of which the production of low-cost oxygen is an outstanding example.

Although the design of existing plants for the production of helium is not entirely new, the process is important as the forerunner of many new low-temperature processes, such as refrigeration in the manufacture of pure chemicals from petroleum. The major use for helium to-day is in lighter-than-air craft, and all production facilities are owned and operated by the Bureau of Mines. These facilities are located in the south-west where helium—a constituent of natural gas in amounts varying from 2 to 8 per cent—is isolated by a process of liquefying the other gases present by refrigeration. Liquid nitrogen, which liquefies at 310°F. below zero, is the primary refrigerant.

CZECH CHEMICAL AGENTS

CZECHOSLOVAK Chemical Works (London), Ltd., is the name of a new company formed in London to act as agents for the Directorate General of the Czechoslovak nationalised chemical industries in Prague. Its aim is to foster mutual trade in chemicals, chemical raw materials and chemical plant between Great Britain and Czechoslovakia. The board of directors is as follows:—

Dr. K. Martinek (Director-General of the Czechoslovak Chemical Works, National Corporation, Prague), chairman; Dr. George Lewi (London), acting chairman; Mr. C. F. Ward Jones (London); Mr. David Finnie (London); M. E. Patin (Paris); Dr. M. Marko (Prague); and Mr. B. Dostal (London), manager. The address of the company is 35 Pont Street, London, S.W.1.

Canadian Embargo.—Included in an extensive list of goods the importation of which into Canada is prohibited as from November 17 are the following: Paints and colours, ground in spirits, and all spirit varnishes and lacquers; varnishes, lacquers, japans, driers, liquid driers, and oil finish. n.o.p.

SULPHITE AND SULPHATE PULP

Improving Technique in Canada and Scandinavia*

THE discovery of a mechanical means of fibre liberation from wood inspired intensive research. The most important development was the discovery of the sulphite method, in which wood is "cooked" in an acid solution of calcium bisulphite.

The manufacture of cellulose by this means rapidly spread throughout the world. To-day the Canadian production of bleached and unbleached sulphites amounts to almost 2 million tons, and the world production to over 10 million tons.

Basic Principles

The sulphite method of fibre liberation consists in reacting wood chips with a solution of calcium bisulphite and sulphurous acid at elevated temperatures and pressures. The bisulphite presumably reacts with the lignin, and there also takes place a hydrolytic splitting of the cellulose-lignin complex.

It has been shown that these reactions are governed both by the hydrogenation and bisulphite-ion concentration, and evidence seems to indicate that the sulphonation reaction is the more important.[1] The calcium salt of sulphonated lignin is rendered soluble, the easily hydrolysable hemicelluloses are dissolved at the same time, and the comparatively stable cellulose remains, its properties and yield depending to some extent on the cooking conditions.

Cooking of the wood chips is carried on with an acid of about 5 per cent total and 1.15 per cent combined SO_2 using direct steaming, for a period of 8½ to 12 hours depending on properties required in the finished pulp. Maximum temperatures vary from 125-145°C. and cooking pressure from 65-75 lb. per sq. in. The pulp so obtained represents approximately 50 per cent of the wood.

All sulphite mills in Canada use lime as a base for cooking acid, both because of its availability and its low cost. The chemical so used is run into the rivers with the lignin and other wood constituents and some sulphur. Attempts have been made from time to time to concentrate this waste liquor and burn it under boilers as a source of steam for the process but due to the nature of the base and the extensive difficulties caused by the deposit of calcium sulphate on the evaporating surfaces, this process is not established.

Recently, there has been developed a process in which magnesia instead of lime is used as the base in the cooking process. In this process the cooking is carried out in the usual manner, and on completion of the cooking the liquor is removed from the pulp by rotary drum washers with as little dilution as possible, concentrated, and burned in a special furnace for the production of steam.[2] The base is recovered as magnesium oxide and may be re-used in the process.

The economics of the process depend to a large extent on the steam obtained from the burning of the liquor. It is the excess steam over and above that required for evaporation which determines the real savings. Total savings of up to $5.00 per ton of pulp over the conventional lime-base process have been claimed.

The use of a soda base to replace the lime base is in commercial operation at Stora Kopparberg's mill in Sweden. Using an acid of 5 per cent, and 1 per cent sodium oxide, chips are cooked in the usual way at a maximum pressure of 100 lb. per sq. in. Digester contents are blown into diffusers and the liquor removed from the pulp. This liquor is then evaporated, thickened, and burned in a Tomlinson furnace. Steam recovery was reported to be 2.8 tons per ton of pulp after the evaporation steam is subtracted.[3]

Troublesome Sulphur

Details as to the liquor recovery and make-up are not known; generally speaking the burning of this liquor has resulted in the formation of many troublesome sulphur compounds which have impeded the general adoption of the process. In the Swedish mill, the soda process is operated in conjunction with the sulphate process and the recovery methods appear to be interdependent.

An interesting method of sulphite operation is that of using an ammonia base system which is operating on a mill scale in Norway. Here, liquid ammonia is dissolved in water and SO_2 absorbed in this 5 per cent solution. The cooking acid contains about 6-7 per cent total and 1 per cent combined SO_2. Cooking is carried out conventionally to completion, and the liquor collected and evaporated in multiple-effect evaporators to a 55 per cent solids content. No "liming-up" troubles occur and the

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*"Pulp and Paper—A Canadian Chemical Process Industry," by Allan C. Hill. *Canadian Chemistry & Process Industries*, October, 1947.

concentrated liquor is either sent to furnaces for burning or to a spray dryer for concentration.

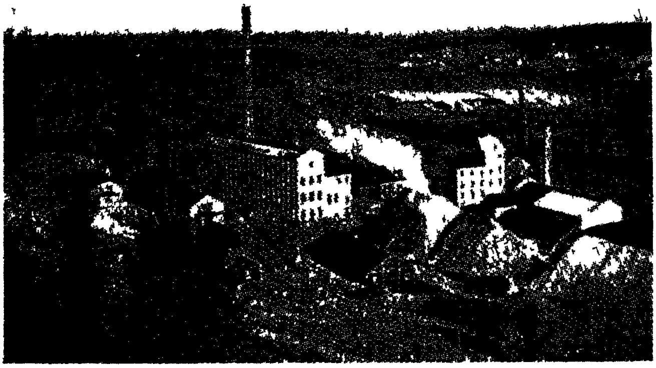
The concentrated liquor is sold in tank cars, or the dried powder in bags for tanning purposes, for ink manufacture, and for other chemical purposes. Its use as a fertiliser is now being investigated. The economics of the process depend first on a cheap ammonia source, and secondly, on a ready market for concentrated waste sulphite liquor of this type.

Ethyl alcohol is a standard sulphite liquor product in practically all sulphite mills in Sweden, and is also manufactured by pulp mills in Finland, Norway, Germany, Canada, and in the United States. The process depends on the fermentation of the hexose sugars present in the liquor to the extent of about 2 per cent. The general procedure is to separate the waste liquor in the pulp with as little dilution as possible, then the waste liquor is stripped of sulphur dioxide, is cooled to 85°C., neutralised with lime, cooled to 33°C., nutrients added and fermented for 24 to 48 hours. The yeast is recovered and may be re-used. Alcohol yields per ton of pulp vary with the grade of pulp being manufactured and the degree of recovery of the liquor; yields of 20 to 40 imperial gallons of alcohol per ton of pulp have been reported.

Manufacturing costs are said to be below those of potato, molasses, or grain alcohols, but possibly alcohol from petroleum waste gas is lower in production cost. However, if a recovery method such as the magnesia process, or the Norwegian ammonia process, is adopted by the sulphite industry, it should be possible to ferment the waste liquor first and remove the alcohol before sending the waste liquor to the evaporators, in which case a low-cost alcohol could be obtained. Some chemists in Scandinavia feel that 10 per cent alcohol is a probability within the next few years.

One of the main difficulties is the use of calcium base in cooking. If the production of alcohol becomes general it would seem likely that there will be a shift to the magnesia or ammonia base method of cooking.

On the basis of Canadian sulphite production of 2,000,000 tons, 40,000 000 gallons of sulphite alcohol are potentially available in Canada.



Svartvik sulphite plant of the Swedish Pulp Company at Sundsvaal

In Scandinavia methyl alcohol is also obtained from the process by rectification, and propanol and butanol from the fusel oil fraction. Throughout Norway, Sweden, and Finland an extensive chemical industry based on alcohol from waste sulphite liquor is being constructed, and in some cases is already very highly developed. Acetic acid is manufactured by the fermentation of absolute alcohol as well as by the oxidation process. Among other products are ethylene glycol, crotonaldehyde, ethyl ether, and even vinyl compounds.

Cellulose Products

The development has gone even further in the field of cellulose derivatives. Cellulose glycollate is manufactured from wood pulp and alcohol-based chemicals, and is used as an adhesive, as a stiffening agent, as an egg white substitute, and for other purposes. Ethyl cellulose and hydroxy ethers of cellulose are also being produced.

The principal constituent of sulphite waste liquor is lignin and while much research has been carried on and some advance made in its utilisation, the problem still remains largely unsolved. A typical analysis of waste sulphite liquor shows:

Total solids	10	per cent
Sugars	2	,, ,,
Lignin	6	,, ,,
Sulphur	0.8	,, ,,
CaO	0.5	,, ,,

Since lignin is a waste product the primary object of the cooking process is to remove it without destroying the yield and properties of cellulose, and thus we obtain not lignin as such but a dilute solution of lignin derivatives more or less markedly changed and accompanied by other waste compounds. This must be borne in mind when considering the long delay in finding a satisfactory method of sulphite lignin utilisation.

A development of considerable importance has been the preparation of lignosulphonic acids.

Briefly, this process consists of fractional precipitation of the dilute liquor to yield inorganic and organic solid products and a clear process effluent.[4] The inorganic product consists of calcium sulphite which may be re-used to make fresh cooking acid. The organic precipitate is obtained in the second stage treatment and consists of a basic calcium lignin sulphonate which may be burned for its fuel value or utilised industrially. Its utilisation as lignosulphonic acid may be carried out by drying and grinding the calcium salt; it is marketed as a Portland cement fixer, for boiler feed waters, and for use in ceramics.

Effect of Calcium Lignosulphonate

Addition of calcium lignosulphonate to concrete gives a denser flowing mix with less water. It has recently been shown that Portland cement particles suspended in water showed neither Brownian movement nor cataphoresis, but both phenomena appeared when a small amount of lignin derivative was added. Absorption of 0.5 per cent calcium lignosulphonate increased the specific surface of a cement dispersion by nearly 50 per cent.

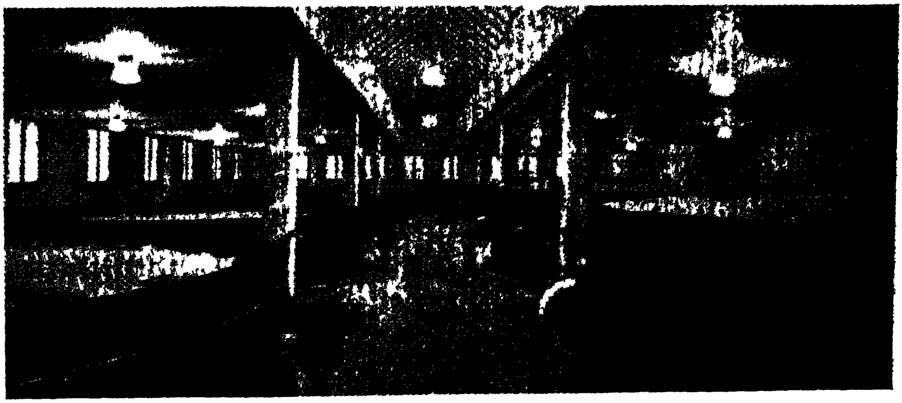
By converting this calcium lignosulphonate into the magnesium and sodium salts, tanning agents are obtained which are marketed in tonnage quantities. These salts are also successfully used in the manufacture of dispersing agents.

Tanning Liquor

The so-called tanning properties of waste liquor depend on the lignin sulphonic acid present, but there is little definite work regarding the reactions between lignosulphonates and hide substance from which to develop further tanning products. Recent work[5] suggests that the larger molecular weight fractions are more desirable. At the present time, a tanning extract is being manufactured in Canada from sulphite waste liquor by precipitating the lime with sulphuric acid and concentrating the liquor by 55 per cent solids, followed by adjustment of the *p*H value, etc. The iron content of the material must be carefully controlled for best results.

The concentrated whole liquor, both as 50 per cent solids material and as a dry powder, has been known as an article of commerce for the past 50 years. Its use depends largely on the combination of the adhesive properties of the carbohydrates and lignin fractions.

Laboratory investigations carried out at the Ecole Polytechnique in Montreal have shown that the addition of sulphite liquor to a road foundation greatly increases its loading capacity.[6] At moisture contents usually met in practice, the required thickness of a sulphite liquor stabilised mat is



One of the most modern installations for the production of alcohol and nutrients from sulphite liquor is this plant at Hörnefors, among the largest in Sweden

considerably less than that of the ordinary clay-stabilised foundation for the same applied load.

Although the sulphite liquor material is water soluble, after mixing with a light preparation of clay and gravel and drying, the stabilised mixture becomes practically waterproof to capillary water, and in this respect compares well with bitumen products in waterproofing the foundation in contrast with the ordinary clay-sand-gravel stabilisation.

Cheap Adhesives and Paper

The adhesive property of the waste liquor is also utilised in the manufacture of low-cost adhesives, as a core binder in foundry practice, for the manufacture of agricultural sprays, and similar applications. Much research is being carried on to develop a waterproof adhesive from this raw material.

The cellulose residue containing some lignin as it leaves the digester is known as unbleached sulphite and after the proper screening operations is suitable for the manufacture of papers and boards of all types where brightness is not an important specification. For the manufacture of higher grade papers, where a pure white is desired, the pulp is bleached with chlorine or hypochlorite.

The bleaching of sulphite pulp for paper manufacture follows the familiar 2-stage process. The first stage consists of the chlorination in continuous system using rubber-lined towers. Consistencies of 3.5-4 per cent are usually employed and the chlorination agent may be chlorine gas or chlorine water, depending on whether the source of supply is situated at the mill or the reagent is received in tank cars. Washing is carried out on suction or pressure filters of rubber covered or stainless steel construction.

The book and printing paper industries use about 70 per cent of the bleached sulphite pulp produced.

Rayon Pulp Manufacture

In the manufacture of rayon pulp non-cellulosic constituents must be removed from the pulp as completely as possible and for this purpose elaborate multi-stage bleaching systems are employed. The essential step in the manufacture is the caustic purification of the fibre by which hemi-celluloses and other extractives are removed, resulting in an improved alpha cellulose content.

To produce a rayon pulp the wood is cooked to a higher degree than is usually the case with paper pulps, both to reduce the residual lignin to a minimum and to maintain the alpha cellulose content as high as possible.

After the usual screening operations, the pulp may be chlorinated with chlorine water or gas as mentioned previously, followed by the heat treatment with caustic soda in which the partly bleached pulp may be treated with 2-6 per cent of NaOH based on the weight of the pulp, at a temperature of 70-98° C. for 2 to 2½ hours at high consistency, the caustic concentration and the temperature being varied as the requirements of alpha cellulose in the finished product demand.

Under these conditions a finished pulp of alpha cellulose of 89-95 per cent content results. Following the caustic heat treatment the material is washed and given a final bleach with calcium or sodium hypochlorite, usually followed by a sulphur dioxide treatment to reduce the lime content.

A pulp of 96 per cent alpha cellulose content said to be suitable for use in the manufacture of cellulose acetate, cupra-ammonium, cellulose nitrate, and lacquer bases is produced by a cold treatment with NaOh of 12 per cent concentration, using rayon pulp of 89 per cent alpha cellulose as the starting material.

A pulp of 98 per cent alpha cellulose content for special chemical uses is also manufactured by treating the 96 per cent alpha cellulose with 12 per cent NaOH in the cold on a rotary drum filter.

Sulphate Process

Because of its tremendous growth in the past few years, particularly in North America, the sulphate pulping process now occupies a position of major importance in the pulp and paper industry.

The sulphate process is an alkaline process, because alkalis lost during the cycle of operations are replaced by sodium sulphate. Actually it is sodium sulphide which plays a major rôle in the cooking liquor, this sulphide being derived from the sodium sulphate by reduction during the alkali recovery.

Pulps produced by the sulphate process are characterised by excellent strength and the greatest application of the sulphate process to-day is in making kraft papers. These are exceedingly strong, tough, and ideally suited for wrappings and bags.

The growth of this industry has been particularly rapid in the Southern United States. From a total sulphate production in the United States of 400,000 tons in 1925, the production has grown to over 5 million tons, the industry being even larger than the newsprint industry in Canada. Canada has also shared in the expansion of the sulphate pulping industry, no less than six new mills being in operation or under way, with a potential capacity of over 1500 tons per day.

In the sulphate process chipped wood is cooked for 2½ to 6 hours in steel digesters at a maximum temperature of 170-190° C. and 100 lb. per sq. in. The liquor used contains approximately 50 per cent NaOH, 30 per cent Na_2, and 15 per cent Na_2CO_3.

As in the sulphite process, directly heated digesters are used; in the newer installations, modern, indirectly-heated digesters are in use and have proved superior to others in steam economy, condensate recovery, and ease of operation.

Since all chemicals used in the cooking process are expensive compared to the sulphite process, elaborate recovery systems are necessary and careful operation and close control of the recovery systems are required for an economic manufacture.

One of the most widely adopted recovery units is the Tomlinson, a unit consisting of a completely water-cooled furnace over which is set a standard B. & W. cross-drum boiler behind which is located a spray tower. Weak liquor from the washers containing about 15 per cent solids is circulated through the spray tower in contact with hot gases from the boiler. It then flows through multiple-effect evaporators where solid concentration is increased to 55 per cent.

Salt cake is added and mixed with black liquor: the mix is sprayed into the furnace under pressure through a nozzle located in the wall. The organic matter in the spray is burnt off and the ash, consisting of sodium salts, falls to the bottom of the furnace from which it flows in a red hot stream to the dissolving tank.

Generally speaking, the heat from the combustion of black liquor is sufficient to produce on the average 40 per cent of the combined steam requirements of the pulp and paper mill.

By-products

During the sulphate cooking process, certain by-products, tall oils, or liquid rosins, are produced and these are being economically utilised in several mills in North America, while in Scandinavia work is continuing on the even greater recovery of these potentially valuable substances.

Crude liquid rosin amounting to 60-90 lb. per ton of sulphate manufactured from pine wood is recovered and this contains about 80 per cent of saponifiable material present as free resin and so-called fatty acids. From this crude rosin, purified tall oil and other important by-products are obtained.

It would appear that the development of by-products from the sulphate industry has reached its highest point in Scandinavia where the fractionated products are used in paint manufacture, coal oils, cable oils, and for soap manufacture.

Since the colour of kraft is brown, its use is limited to those products in which its high strength is of major importance. Its most important application is in bag, wrapping, and container board manufacture.

A most significant development of the kraft picture is the preparation of high white pulps from unbleached sulphate by employing multi-stage bleaching systems, usually from 4 to 7 stages depending upon the colour required in the finished product.

In most instances, bleaching begins with acid extraction or alkaline wash. Following this, chlorination may be repeated or hypochlorite may be used. The fourth stage usually consists of a further hypochlorite bleach followed by a soaking period to remove soluble colouring bodies. A final hypochlorite bleach followed by water washing is then undertaken, and a sulphur dioxide treatment completes the operation. Alkaline extractions are carried out at temperatures between 50° and 90° C., the exact conditions depending entirely on the type of pulp which is required. These reactions are largely carried on in towers equipped for continuous fractions.

Chlorine Consumption

Chlorine consumption for such a process is high and might vary between 130-200 lb. of chlorine per ton of bleached pulp. Lime consumption equals about 65 lb. per ton and caustic requirements are about 100 lb. per ton of bleached product.

The pulp so obtained is used in the manufacture of a variety of white papers including white wrapping, rag papers, folder stock, bond, envelope, and in general those papers which require strength as a foremost quality. Bleached kraft is also used as a base for machine coated papers.

(1) Can. Jour. Research.—B. 15, 457-474 (1937).
(2) Pulp & Paper Mag. of Canada.—45, No. 11 817-820, (October, 1944).
(3) Hill & Campbell.—Developments in Pulp and Paper Manufacture in the Scandinavian Countries. C.P. & P.A. February, 1946.
(4) Howard—Ind. & Eng. Chem. 26, 614 (1934).
(5) Buchanan, Lollar and Niemeyer. The Tanning Properties of Lignosulphonates Produced by Different Cooking Conditions.
TAPPI Meeting (February, 1947).
(6) Piette & Demers.—Roads & Bridges. 83, No. 9 70-73, 114-118 (1945).

TURKISH CHEMICAL EXPANSION

THE U.S. Department of Commerce publication *International Reference Service*, No. 45, September, in an economic review of Turkey, refers to the revival of a number of projects envisaged in that country's second five-year plan which took effect from 1938 but was delayed by the war. Tentative plans have been made to extend the chemical industry, such products as nitric acid, nitrates, caustic soda, sodium carbonate, copper sulphate, and carbon sulphide being mentioned. Two additional plants for the manufacture of cement are said to be under consideration.

Demand for Nationalisation

Indian Spokesman Attacks Chemical Companies

A DEMAND that chemical industry in the United Provinces, as one of the vital industries on which depended the future health of the people of the Province, should be nationalised, was made by the Chemical Mazdoor Union of Cawnpore, which gave evidence before the United Provinces Labour Inquiry Committee.

The chemical workers' spokesman argued that since the popular government was embarking on an ambitious programme of health-building, it was necessary to standardise the various vaccines, injections and other medicines produced in the numerous chemical factories in the Province to obtain the maximum results. The chemical and pharmaceutical industry should be the first to be taken under Government control.

The union spokesman went on to allege that, while disproportionate profits were being made, workers were being poorly paid. The minimum, he suggested, should not be lower than Rs.35 per month, and he urged that 30 per cent of " the entire profits of the industry should be distributed to employees as a bonus. He rejected the chairman's reminder that most undertakings in the industry had recorded a loss, citing the case of glass tubes which, he said could be produced at a cost of about A2 and sold for R1-8-0.

There was a tremendous future for the industry if it was well managed. Cawnpore has been selected for the chemical industry not only because it is a big industrial centre but also because the textile mills and the leather industry provide a good market for the many chemicals produced.

Manufacture of Sodium Silicate

Sanction has been accorded by the Dhrangadhra State Government, India, to a private company for the manufacture of sodium silicate, used in making artificial stone and in various industrial processes, chiefly as a filling agent in soap making.

In pursuance of its policy of encouraging infant industries, the Government has offered to exempt the new concern from paying the statutory duty on imports of machinery and building materials, and to permit it to use local stones in the manufacture of sodium silicate free from duty.

The Government has also promised to help the concern in obtaining 30 tons of soda ash every month, if the company starts working within three months and manufactures 90 tons of sodium silicate monthly.

Sulphite Plant for India.—The Swedish Franö sulphite factory has sold its plant to a firm in Calcutta where it will be re-assembled by Swedish engineers.

New Source of Plastics

Palestine Develops the Castor Bean

THE castor bean and its disagreeable derivative, castor oil, may become the means by which Palestine chemists can make a going concern of the arid, sand-duned Negev in the south of the country. Scientists working at the Daniel Sieff Research Institute at Rehovot have produced from castor a nylon-like substance which they believe can form the basis of a Palestine plastics industry. From the poisonous residue of the bean they have developed by chemical neutralisation a rich live-stock feed to supplement the country's inadequate grain supplies.

The work has been going forward at the 13-year-old institute for many months. It has included development by natural selection of a castor bean containing up to 60 per cent oil. It is believed that the castor bean will thrive in the Negev if properly cultivated.

Pilot Plant

With colleagues in Palestine and associated scientists in Paris, Dr. Leon Haskelberg, an organic chemist has found a method of breaking down castor oil by chemistry to produce a colourless, odourless material easy to work with. The Institute is at present setting up a pilot plant to make it in quantity for development of commercial uses—thread for textiles, and plastic articles for the home and industry.

Dr. Haskelberg and his team have developed other castor-oil derivatives, among them basic substances for perfumes and insecticides. They hope, in addition to making the development of the Negev possible, to help broaden the country's agricultural and industrial basis.

Clove Oil Outlook

A guardedly optimistic view of the Zanzibar clove oil position is taken by Mr. E. Lyle Pixton, purchasing manager of Monsanto Chemicals, Ltd., who has just returned from a visit to the island on behalf of British vanillin manufacturers, the Colonial Office and the Ministry of Food. Government agricultural scientists in Zanzibar hope to cultivate a dwarf hybrid tree whose cloves could be gathered without wastage. At present the collection of cloves is restricted by the fact that many of them grow inaccessibly on 40-foot trees.

In London last week, Mr. Pixton said :—" The Zanzibar Clove Growers' Association offers reasonable hopes of clove oil being offered in sufficient quantities at a reasonable price. I explained to them quite frankly that unless the present situation improves, British manufacturers of vanillin would have to contact other sources for their raw materials."

Metallurgical Section

Published the first Saturday in the month

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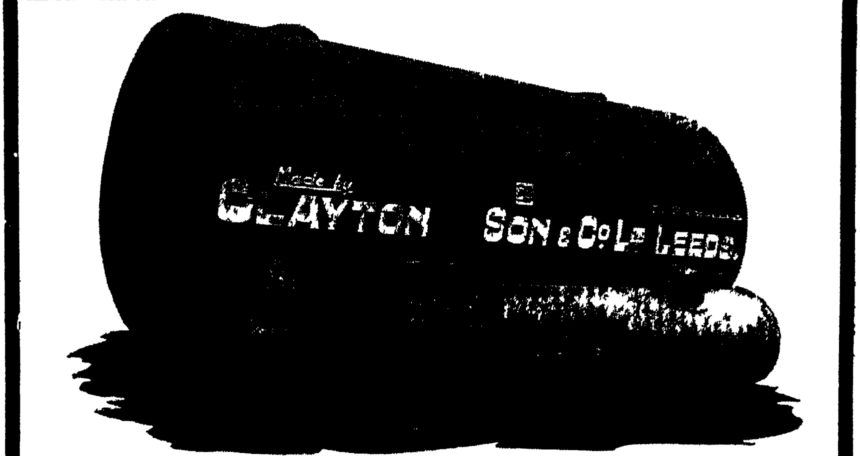

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Metallurgical Section

6 December 1947

Oxygen Enriched Blast

Wide Use in German Industry

THE use of oxygen-enriched blast for metallurgical processes in the U.S.A. has generally related to open hearth methods and has been widely applied there within recent months. In Germany, however, the emphasis has been on blast furnace production, according to a report on the use of oxygen in the German iron and steel industry by Dr. Walter M. Pollitzer, a U.S. Government investigator.

Pig iron as well as ferro-chromium are produced in Germany from low-grade materials with oxygen-enriched blast. Pilot plant experiments have been conducted successfully since 1935 in one large blast furnace, and at two other places in low shaft blast furnaces. One large steel mill in Germany has used oxygen enriched blast for its basic converter for more than ten years.

German experience has resulted in important advances in economical production. Pig iron, for instance, has been successfully produced from normal or low grade ores, ferro alloys from ores otherwise considered sub-standard, and high quality steel in basic converters with heavy additions of cold scrap.

Pioneer Experiments

So far as is known, the Gute Hoffnungs Huette plant at Oberhausen was the first large steel firm in the world to build a blast furnace for experiments with oxygen-enriched air, according to the report. At that time (1933) the Frankl method for producing oxygen cheaply had been developed Experiments at Oberhausen proved that the oxygen-enriched method of pig iron production was economical and that all technical metallurgical problems could be mastered.

Dr. Pollitzer's report contains a technical description of the Oberhausen experiments and two tables of test results. "The coming era in iron and steel production will have to utilise more and more low grade ores and fuels," Dr. Pollitzer states, "so the industry will be compelled to look to new methods. General economic considerations can lead to the application of more concentrated blast in other metallurgical processes, so the progress made in Germany under war pressure may prove useful stimulus to work in other industries."

[Utilisation of Oxygen in the German Iron and Steel Industry, Number PB-81385, 26 pages, mimeographed; 75 cents from the Office of Technical Services, U.S Department of Commerce, Washington 25, D.C]

Electronic Comparator

Automatically Distinguishes Metals

AN electronic instrument, the metals comparator, has been introduced by the special products division of the (U.S.) General Electric Company for providing a quick, non-destructive comparison of either magnetic or non magnetic metal parts with a standard. Parts appearing alike but differing in composition can be separated quickly with the new instrument which has been used to differentiate between annealed and unannealed steel bars, and also to sort finished metal parts with different compositions or heat treatments.

The new metal comparator in use

The comparator employs a balancing network and indicating instrument mounted in a steel cabinet to which is connected an external test coil. In operation, a reference specimen for the group of specimens being compared is first placed in the test coil and adjustment made to secure the initial balance. This is indicated by a zero reading on the indicating instrument. After the reference specimen has been removed, the parts to be tested are inserted briefly in the coil one by one. When tolerances have been established, specimens can be accepted or rejected on the basis of the dial reading. As many as 1500 small parts can be tested in an hour.

WELDING AND FLAME CUTTING

Rapid Repairs Help to Maintain Production

by C. W. BRETT, M.Inst.W.*

CONFLICTING statements make it hard to assess the extent and power of the blows that, we are told, will further handicap industry in the near future. While it would be foolish to be over anxious, it would be prodigal to neglect any means of increasing the quality and quantity of output. The emphasis upon export requirements is still further deferring the replacement of much needed plant in this country and retarding developments of various kinds.

In this respect the chemical industry is in a position no better than other equally important production spheres; in fact, there are some aspects in which it would appear to be worse off. An analysis has been made in certain quarters of the resources available to facilitate modifications of plant, and also to indicate the best methods with which to tackle maintenance and repair problems. The result of this has been to emphasise the dependability, low cost and speed of modern methods of welding.

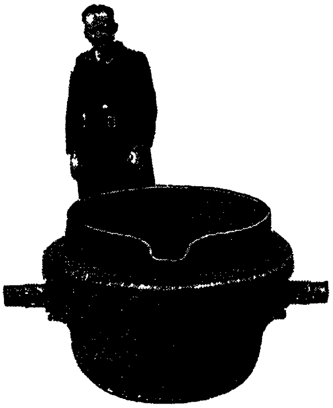
A large cast iron cauldron extensively cracked and destined for scrap

Corrosion Problems Solved

The following clearly supports that conclusion. A short time ago a firm of scientific welding specialists was consulted in regard to large pressure containers used for somewhat corrosive materials. This had led to inordinately high maintenance costs. Obviously a lining was required to protect the mild steel of which the holders are composed. After careful consideration strips of corrosion resisting metal were welded to the inside of the container until it was entirely covered. The cost was relatively small but the modification has very greatly increased the life of this item of equipment.

Not long ago work of this kind was sometimes impracticable because of the wide difference in expansion and contraction between one or other of the metals being welded. A method has been devised to overcome this difficulty which, at one time, seemed almost insuperable.

Much of the success achieved in this connection is due to improved means for restricting heat flow from the localised area in which the actial work of welding is being carried out. In view of the fact that 6000°-7000° F. are essential to successful welding of this kind it might not seem possible to prevent local expansion causing distortion and even cracks. In fact, so efficient is the equipment now used and the technique applied by the operator that if welding ceases momentarily it is possible to touch close to the centre of the work without discomfort. The problem of the dispersion of heat has been overcome.



The same vessel completely rehabilitated by welding, which has repaired the fissures and replaced metal eroded by use

In the lining of containers subject to corrosion, sprayed metal is sometimes applied, but for heavy duty, where considerable thickness of material is involved, the use of welded strips of stainless steel or other resistant material is favoured. Spraying, too, has many uses of a similar kind. A wire or powder of the metal it is required to spray is passed through an oxy-acetylene flame. The molten particles are ejected by a stream of compressed air and a tenacious coating is built up upon any matt surface. It is this process which has taken the place of some forms of galvanising. while the spraying of stainless steel together with other special alloys may provide a means of prolonging the life of plant and consequently reducing the cost of upkeep.

An aspect of the latter process that should not be overlooked is the porosity of the sprayed metal, although this does not prevent it from taking a high polish. It is a factor, however, which is often an advantage, as for example its ability to retain lubricating oil in the pores of the metal

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* Managing director, Barimar Ltd.

Multi-Layer Work

A point that arises, sometimes in the form of unfounded criticism, is the influence of the weld upon heat-treated steel. This influence is always compensated. If the characteristics of the weld are likely to be influenced locally then restoration is merely a matter for further treatment.

A fact apt to be overlooked is the automatic correction that takes place with certain classes of repair. In the case of multi-layer welding applied electrically a run of weld metal has a valuable normalising effect upon the run which immediately preceded it. Moreover, work of this class has a much finer grain and is far more reliable than a heavy single-layer weld which is apt to have a coarser crystalline structure.

As the final run of welding is not normalised in the manner of the previous run an adequate amount of surplus metal is left on the component so that when it is finally machined the weld consists of normalised metal throughout.

So effective are the results that the method is applied to crankshafts of all kinds. One of these handled recently weighed more than 30 cwt. and not long ago the crankshaft of a railway locomotive was re-united with equal success. Truth of alignment is guaranteed to within .001 in.—no small feat, seeing that distortion usually follows a smash of this kind.

Metals that are totally unlike one another in their characteristics, such as aluminium and steel for example, can be welded together perfectly. This is done with such strength that if a test to destruction is made it can be proved that the area of union is definitely stronger than the weaker of the two parent metals. This development opens up an entirely new field of opportunity, not only in relation to repair work but in new construction.

Scientific welding lends itself to the production of special machines of which, possibly, one only may be needed. By fabricating steel plate lightness is obtained combined with great strength. In addition the work is far cheaper than if castings were used, for patterns are rendered unnecessary and unless the cost of these be spread over an adequate output of castings the outlay is a very serious expense item.

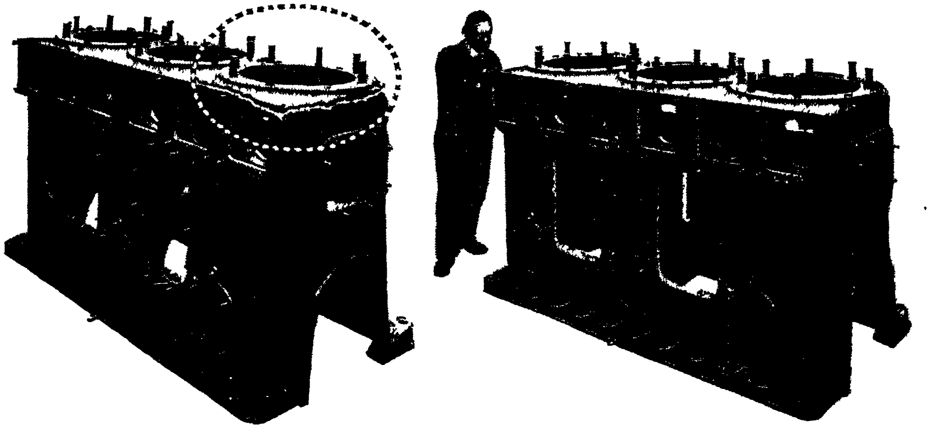
Most repair work on plant or parts weighing less than 12 tons is sent to the shops of specialists; where greater weight or possibly unwieldiness renders transport uneconomically possible, self-contained equipment and specially trained operators are now available to deal with emergency work on the site.

An important adjunct of modern welding is a well-equipped machine shop to which certain types of components must be passed for precision machining. In this way responsibility is not divided, perfect fitting is assured and the work can be guaranteed.

Assured Results

Welding repair work in particular calls for a very high degree of craftsmanship on the part of the operator and strict inspection is made at various stages involving the use of radiography. The examination nowadays is so searching that any flaw, no matter how small, can be detected and eliminated at once.

(*Continued on page* 734)



Specialised welding methods were responsible also for this "before and after" contrast, a piece of work which restored to use a vital diesel power unit which could not readily have been replaced.

One indication of the trust currently reposed in welding is its application to boilers of all kinds when they are in need of reconditioning. Riveted patches are avoided entirely since new sections of plate can be butt welded in position, leaving a perfectly clean surface inside and providing a completely adequate margin of strength. This method is approved by insurance companies.

Another line of progress is the increased thickness of metal that can be handled. Some massive castings repaired recently had a section of 10 in. but even such a substantial thickness of metal does not represent the maximum that can be welded. At the other end of the scale extremely delicate precision parts may be restored to a condition equal to new.

A phase of modern progress that deserves close attention is the increasing application of light metals. Output in this direction has grown immeasurably during the past seven or eight years with the result that production costs have dropped. Even magnesium alloys which may be highly inflammable in the form of swarf or filings can be welded perfectly and without risk. In common with all repair work, however, experience and skill of a high order are among the essential ingredients in this kind of work.

More and more industry is looking toward scientific welding both to help out in time of emergency as well as to aid in many branches of productive work.

Flame Cutting

An ancillary process, flame cutting of components, has now reached such a degree of accuracy that it is common practice to form gear wheels and sprockets in this way. Many machines now in operation have flame cut pinions, not one of which requires machining after being shaped from the solid. This, of course, is not done by hand; for the flame follows the contour of a master pattern with extraordinarily accurate results.

There is a striking contrast between the various types of work tackled and equal variety in the metal needing attention, but whatever the latter may be it can be matched with a suitable welding rod. The weld is invisible and, when it is required, a considerable increase in strength can be imparted to enable a component to deal with overload safely or meet conditions more severe than those for which it was originally designed.

Sometimes gear wheels are broken; it is immaterial whether they are of steel, cast iron or non-ferrous metal, for even when teeth are smashed and lost they can be built up afresh and re-cut with absolute precision. An important consideration just now is the short time in which even complex repairs are carried out. Usually a job can be completed within 24 hours even when a certain amount of final machining is required.

(*Continued in next column*)

(*Continued from previous column*)

This facility for quick replacement goes far towards answering the current shortage of replacement parts. A proportion of new replacements are no doubt indispensable, but in a majority of cases an all round saving would result from modern methods of repair, a saving not only in time and money to the owners but a national economy in freeing capacity to turn out more material for export.

The delicate adjustment that seems essential to modern production methods is easily upset by the failure of one of a plant's key components. Because it permits such an item to be restored more rapidly than a replacement could have been obtained at the best of times, the welding industry is to-day playing a part in maintaining output the importance of which can hardly be over-estimated.

Widespread Tungsten Shortage

Japanese and U.S. Supplies Inadequate

A SURVEY report on tungsten resources of Japan, prepared by H. R. Klepper, scientific consultant with the U.S. Army in Japan, containing a brief analysis of the production and exploitation methods used in eight major tungsten deposits has been placed on sale this week by the Office of Technical Services, U.S. Department of Commerce. The report points out that all Japan's tungsten mines and plants for processing tungsten concentrates stopped production in August, 1945, although small-scale operations were resumed at eight mines in 1946. These mines produced 42 tons of concentrates in the first six months of 1946, and the concentrates are estimated to contain between 50 and 60 per cent tungsten trioxide.

If Japan can purchase foreign (Korean) tungsten concentrate to fill her industrial requirements, it is almost certain that only two or three of her tungsten deposits would be exploited economically and that the domestic output in any year would probably not exceed 150 tons of concentrate containing 60 per cent tungsten trioxide.

In the United States, tungsten ore deposits that were exploited during the first world war in Boulder County, Colorado, and Atolia, California, have been nearly exhausted, according to a recently completed survey of America's resources. Although more tungsten may be found, the United States will probably be forced to rely heavily on imports.

STAINLESS STEELS FOR THE ENGINEER

FROM the metallurgical point of view, stainless steels useful to the chemical engineer are: (1) non-hardening chromium-iron alloys, (2) chromium-iron-carbon alloys, with or without nickel, hardenable by quenching, and (3) anstenitic iron-chromium nickel alloys, non-hardening or hardened by precipitation.

In addition, the steels have been tabulated by B.S.S. and A.I.S.I. specification number, listing mechanical properties and giving notes on applications.

A further useful table (given here) represents weight losses in various acids.

WEIGHT LOSS OF STAINLESS STEELS IN GMS./IN^2./24 HRS.

Reagent	Temperature	18Cr./8 Ni.	18Cr./18Ni./Mo./Cu.
69.8% HNO_3	20°C.	0.0000	0.0000
	b.p.	0.0006	0.0011
20% HCl	20°C.	0.0512	0.0008
80% H_3PO_4	b.p.	0.7896	0.0084
10% H_3PO_4	b.p.	0.0000	0.0000

The table is only a rough guide since it was drawn up from experiments with pure materials, and industrial liquors with their impurities may give pitting corrosion, despite the apparently favourable results shown here.

There is a gain in resistance to attack as one passes along the range of compositions, 13 per cent Cr, 17 per cent Cr/2 per cent Ni (S80), 18 per cent Cr/8 per cent Ni. Further additions of Mo and of Cu increase corrosion resistance.

Because of its generally greater corrosion resistance and its more ready production and fabrication, the 18 per cent Cr/8 per cent Ni type, with or without additional elements, is the most important stainless steel in chemical engineering.

In addition to molybdenum; copper, titanium, columbium and silicon in various combinations are important additions from the point of view of resistance to inter-crystalline corrision, especially after welding.

Welding

The 18/8 materials can be welded by practically all the normal techniques. Early attempts resulted in "weld decay" when the weld was exposed to corrosive conditions. This is due to chromium carbide precipitation at grain boundaries when the steel was heated to 600°-700°C. Since the corrosion resistance depends on the chromium, the region adjacent to the weld, which is denuded of chromium, becomes liable to attack. Titanium and columbium form carbides in preference to chromium under these conditions. Consequently, the addition of these elements improves the welding properties of these steels. In Britain titanium is more usual, in U.S.A., columbium. A large proportion of the stainless steels used in chemical engineering are of this type.

Machinability

The anstenitic stainless steels are tough, requiring best quality tools and special conditions of steel and feed for machining. In order to improve machinability, incorporation of small quantities of lead, copper, sulphur, selenium, zirconium and molybdenum have all been attempted. In one instance, a drill seized after four holes in a 18 per cent Cr/8 per cent Ni/1 per cent Ti alloy, but in a corresponding free-machining quality more than 280 holes were achieved.

Corrosion resistance is not influenced by these additions and, in some cases, no changes in micro-structure are evident. Sulphur, however, does affect the structure.

Many of the heat-resisting stainless steels are still very tough and very difficult to machine, although doubtless they will also be made more machinable.

Conclusions

Stainless clad plate is another variant of importance to the chemical engineering industry. A sandwich with mild steel as filling is produced by rolling together the clean surfaces. Difficulties, however, arise in welding and in the stresses within the material due to unequal coefficients of expansion of its component parts.

The material most widely used remains mild steel with relatively low tensile strength, good machinability and low cost. In general engineering, only highly stressed parts or conditions of high temperature call for alloy steels.

Of the stainless steels, the 18 per cent Cr/8 per cent Ni type is of widest application. Compared with mild steel it is a difficult and expensive material to manipulate, but not when compared with other materials of comparable performance.

From "The Selection of Stainless Steels for the Chemical Engineering Industries," paper presented to the Society of Chemical Industry by Mr. L. Rotherham.

Light Metals Statistics

Ministry of Supply statistics, relating to U.K. production, consumption, imports and uses of light metals in September, have been issued as follows (in long tons):

Virgin aluminium: Production 2212, imports 16,176. *Secondary aluminium*: Production, 8515. *Uses* (*aluminium scrap arisings*): 10,576, consumption 8014. *Aluminium fabrication*: 19,872. Magnesium *fabrication*: 234.

Resistant Powder Alloys

Stainless Steel Developments

THE American Electro Metal Corporation has recently introduced a new method of production of a material and products having the physical and chemical properties of stainless steel, in a more economical and satisfactory manner than hitherto. Powder metallurgy technique is employed, and two types of product are obtained: (a) soft, semi-hard, and hardenable kinds with 12-14 per cent chromium and 0.1-0.5 per cent carbon; (b) austenitic, less or not hardenable kinds, with 7-12 per cent nickel, 18-29 per cent chromium, and 0.04-0.4 per cent carbon. These form the subject of English Patent Application No. 11363/1947 under Convention date May 1, 1946. Manganese or other additions may be present up to 1 per cent.

Stainless steel powder produced in any known manner is compacted under pressures of 20-75 tons/sq. in. into a coherent porous matrix in bar, ingot, or the finished shape required, which is then infiltrated with copper, silver, tin or their alloys, so that the pores are completely filled, and the matrix on cooling is firmly bonded with infiltrating particles, and in particular is superficially alloyed. If desired the matrix can be presintered before infiltration.

By compacting the matrix under such pressure the wear on moulding dies is considerably reduced and a suitable porosity of 15-25 per cent is obtained. Porosity can, of course, be reduced by higher pressures or by presintering.

The steel powders used should have varied particle size, *e.g.*, about half should be −100 mesh and the other half + 325; but other variations may be used. The copper powder is preferably of the shotted or comminuted type, as the electrolytic kind is unsuitable owing to gas formation.

Good Corrosion Resistance

An alloy powder of 65-95 per cent copper, 3-5 per cent iron, and/or 3-10 per cent nickel, and/or 3-10 per cent manganese, with or without other constituents was found particularly effective. Various examples are given and tests recorded in regard to tensile strength, hardness, etc. Corrosion resistance is said to be very good.

Test bars were usually heat treated in cracked ammonia at 650° C. for an hour, were precipitation hardenable, and showed a tensile strength of about 90,000 p.s.i. at elongation of 20 per cent. If the heat treatment was for four hours at 375° C. tensile strength was 88,000 p.s.i. and Rockwell B. hardness practically the same, at 86.5. Tin alloy is preferred in some cases for infiltration, when the product is required for low temperature applications, such as in food containers.

Coal and Steel

Africa's Industrial Prospects

A FORECAST that South African coal will be exported at a rate of millions of tons, and high-quality steel prices will be considerably reduced, was made by Sir Miles Thomas when he addressed the Royal African Society last week on the prospects for industrial developments in Africa.

As a means of improving the dollar relationship, he instanced the export of coal from the Wankie mines of South Rhodesia to Argentina. Seams at these mines are 26 ft. thick, said Sir Miles, and lie only 200 ft. below the surface. By the use of native labour, which is available at 5s. a shift, and the application of modern techniques of production and transport, the cost of coal at the pit head is only 10s. a ton. He added that at an annual production rate of 2¼ million tons, the deposits will last for 2000 years.

By utilising the hydro-electric potentialities of the Zambesi and Kariba and applying the cheaply generated current, which would cost less than half a farthing a unit, to refining mineral ores in the districts there, steel ingots could be produced at prices 25 per cent lower than those ruling to-day.

AMMONIUM NITRATE

Dutch Produce Safety Additive

AN interesting development in the production of ammonium nitrate fertiliser comes from the Netherlands State Mines, which is adding dicalcium phosphate as a filler. The chemical is said to contain 40 per cent of useful plant food (20 per cent nitrogen, and 20 per cent citrate-soluble phosphorus pentoxide). The phosphate and ammonium nitrate are not mixed as such, the nitric acid necessary for the production of the ammonium nitrate being first used to dissolve phosphate rock. By neutralising this solution with gaseous ammonia, ammonium nitrate and dicalcium phosphate are formed simultaneously. It is understood that no special raw materials are required for the conversion of the phosphate rock into a valuable fertiliser.

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American Chemical Notebook

From Our New York Correspondent

A RAPID new process for manufacturing alcohols and other essential industrial chemicals from petroleum has been made possible by a recently developed catalyst which stimulates the conversion of ethylene gas and other compounds of the olefin group so that the entire process takes only a few minutes instead of hours. The new process, which Prof. H. Adkins, of Wisconsin University, has just described in Chicago, has the added advantage of requiring less heat and pressure, he said. It has been customary, heretofore, to treat olefins with carbon monoxide, hydrogen, and a cobalt catalyst to change them to alcohols and other chemicals. In the new process the cobalt is first combined with carbon monoxide and hydrogen to form a complex catalyst which is extremely efficient. All the reactions are carried out under a pressure of about 1450 lb. per sq. in., 100 times normal atmospheric pressure, and the chemicals involved are heated to about 120° C. The complex catalyst is easily regenerated as rapidly as it is consumed, according to Prof. Adkins, making it possible to establish the process on a continuous and semi-automatic basis.

* * *

Mr. Thomas G. Digges has been appointed chief of the Thermal Metallurgy Section of the U.S. National Bureau of Standards, succeeding Mr. D. J. McAdam, who had been chief of the section since 1930 and retired on August 31. Mr. Digges, a member of the Metallurgy Division since January, 1920, is the author of studies on machinability, tool steels, and cutting tools, and work on thermal analysis and critical-cooling rates of high-purity alloys of iron and carbon which established his reputation as a metallurgist He has contributed widely to research and technical journals.

* * *

United States production of inorganic chemicals in September maintained a high level, although lower than the figures for August. Results of the continuous monthly survey of 35 industrial chemicals conducted by the Bureau of the Census, Department of Commerce, show that the national output of 27 chemicals in the group was greater this September than in the corresponding month a year ago, but 22 of the 35 chemicals were below the August level. The lowest production total for any month of the current year was recorded in September for synthetic anhydrous ammonia, ammonium nitrate solution, and nitric acid. Output of these was, however, well above that of a year ago. Compounds showing a lower production in September than in August but above other months of this year and September of last year, include chlorine, hydrochloric acid, phosphoric acid, soda ash, caustic soda, salt cake and sulphuric acid. The production of carbon dioxide (liquid and gas) fell in September after rising steadily since last February. Oxygen production also declined in September, but hydrogen output continued upward to approximately the 1944-45 levels. September production of the chromium chemicals and chrome pigments, except zinc chromate, showed slight gains over August.

* * *

At a recent Detroit meeting of the American Institute of Chemical Engineers, reference was made to the U.S. adaptation of the German Fischer-Tropsch process for the production of synthetic motor fuels. Plans have been drawn up for the erection of two plants to produce liquid fuels from natural gas on a commercial scale. The process may soon be used with coal as the starting material. Several plants using both coal and natural gas are planned by U.S. industry, according to an official of the U.S. Bureau of Mines which has been interested in the manufacture of synthetic fuels for some time. The U.S. contribution to the Fischer-Tropsch technique has been the elimination of the large number of heat exchangers required by the German process, and shortening of the reaction time.

* * *

Nicotine is now being recovered from the exhaust air of tobacco·driers, says a report by the Permutit Company of New York. The tobacco is redried before manufacturing operations, and the hot air from the driers contains a small amount of nicotine. By scrubbing this air with water, the nicotine is dissolved out, and by passing the scrubbing water through ion-exchange materials, the nicotine is selectively removed. Although ion-exchange is a well-known operation, new ion-exchange materials and processes are being discovered and the removal of nicotine from the drier exhaust gas is an example of the minute quantities of chemicals it is possible to obtain by this method. The nicotine content of the tobacco leaf varies from 2 to 8 per cent, a figure which permits the recovery of 175 lb. of nicotine a week from 100,000 lb. of tobacco. By chemical treatment of ion-exchange materials, efficient recoveries of nicotine are obtained, after which the ion-exchange materials are put back into operation again.

1500 TON MAGNET

A GREAT apparatus with a 1500 tons magnet for the study of atomic nuclei is to be installed in the Liverpool University, said Sir James Chadwick, Professor of Physics, in a lecture to the University Physics Society. Work on the exterior of the atom was virtually finished, he explained, but the secrets of its nucleus had yet to be solved. The difficulties here were very great, because the particles of the nucleus were so closely bound together; he thought it very likely that the laws of quantum mechanics would apply to the forces between those particles. The cyclotron had made it possible to produce particles with the energy of at least 10,000,000 volts, but in work now waiting to be done, particles of far higher energy levels entered into the matter. If they could get particles with the energy of about 250,000,000 volts, they could expect spectacular advances in nuclear theory. Such machines were being built in America.

Dutch Chemical Process for U.S.

The American Cyanamid Corporation has acquired the right to use a Dutch chemical process obtained from the laboratories of the Dutch State Mines enabling it to conduct large-scale experiments with the carbon washing cyclon. It is suggested that the arrangement will prove an exceedingly profitable one to Holland. First tentative conferences between Dutch and U.S. chemical industrialists were held recently while two leading officials of the Spencer Chemical Co. were visiting the State Mines.

South African Superphospates

African Exposives and Chemical Industries, Ltd., Johannesburg, write to point out that in an article on South African chemicals (THE CHEMICAL AGE, October 11) the total South African production of superphosphates was underestimated. African Explosives & Chemical Industries, Ltd.—the company writes—are the sole producers of superphosphate in the Union, manufacture being carried out at two points—Umbogintwini in Natal and Somerset West in Cape Province. At present the total capacity of the two factories is about 330,000 tons per annum made up of 150,000 tons at Umbogintwini and 180,000 tons at Somerset West. Production at present proceeds at this rate. Extensions to the Umbogintwini factory will, however, be completed next year, when its capacity will be increased to 320,000 tons per annum. With the maintenance of Somerset West's production at 180,000 tons per annum, the potential annual output of the Union will then be 500,000 tons.

NEXT WEEK'S EVENTS

MONDAY, DECEMBER 8

Society of Chemical Industry (Yorkshire Section and Plastics Group). Chemistry Lecture Theatre, University, Leeds, 6.45 p.m. M. G. Evans: "The Mechanism of Polymerisation."

Chemical Society (Birmingham Section). Main Chemistry Lecture Theatre, University, Edgbaston, 4.30 p.m. W. A. Waters: "Mechanisms of Oxidation."

Royal Institute of Chemistry (Hull and District Section). Royal Station Hotel, Hull, 7 p.m. L. E. Jones: "Patents and the Chemical Literature."

Institution of the Rubber Industry (Midland Section). James Watt Memorial Institute, Great Charles Street, Birmingham, 7.15 p.m. Dr. D. Parkinson: "Newer Developments in Carbon Black."

TUESDAY, DECEMBER 9

Royal Institute of Chemistry (London and S.E. Counties Section). Material Research Laboratory, Philips Lamps, Ltd., New Road, Mitcham Junction, 6.45 p.m. C. G. A. Hill: "Luminescent Materials—Their Properties and Uses."

Institution of Chemical Engineers. Apartments of the Geological Society, Burlington House, Piccadilly, W.1, 5.30 p.m. N. H. Pratt: "The Heat Transfer in a Reaction Tank Cooled by Means of a Coil."

WEDNESDAY, DECEMBER 10

Society of Chemical Industry (Food Group). Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 6 p.m. Five papers on aspects of the food industry.

Institute of Welding (North London Branch). The Technical College, Barking Road, East Ham, E.6, 7.30 p.m. Mr. C. E. Slade: "Developments in Resistance Welding."

Manchester Metallurgical Society. Engineers' Club, Manchester, 6.30 p.m. Ivor Jenkins: "Controlled Atmospheres for Heat Treatment of Metals."

Royal Society of Arts. John Adam Street, London, W.C.2, 2.30 p.m. M. Graham: "Science and the Fishing Industry."

THURSDAY, DECEMBER 11

Chemical Society. Chemistry Lecture Theatre, The University, Liverpool, 4.30 p.m. Professor F. G. Young: "Hormones and Enzyme Action."

Scottish Engineering Students' Association. Institution of Engineers and Shipbuilders, Glasgow, 7.30 p.m. E. G. Yarrow: "Water Tube Boilers."

International Society of Leather Trades Chemists (British Section—Northampton Group). College of Technology, St. George's Avenue, Northampton, 2.30 p.m. J. G. Evans: "Polymers."

Pharmaceutical Society of Great Britain. 17, Bloomsbury Square, W.C.1, 7.30 p.m. Dr. Adrien Albert: "Modern Knowledge of Protein Structure and its Pharmaceutical Significance."

FRIDAY, DECEMBER 12

Scottish Engineering Students' Association. Royal British Hotel, Edinburgh, 7.30 p.m. E. G. Yarrow: "Water Tube Boilers."

SATURDAY, DECEMBER 13

Institution of Chemical Engineers (North Western Branch). College of Technology, Manchester, 3 p.m. C. Toyne: "Heat Transfer in Agitated Pans."

TECHNICAL PUBLICATIONS

"GERMAN Scientific Literature Published during the War" (FIAT Final Report No. 676, 10s. 9d. post free), contains 120 pages and outlines the work done by Signal Corps investigators in the selection and collection of recent unclassified German scientific literature for a reference library. It gives some information on other allied agencies which carried out investigations in this sphere. Furthermore, it gives details about German publishers and the German book trade, about intact libraries, scientific journals and books published during the war. It includes list of some 600 books published since 1939, *inter alia,* one on physical and electro-chemistry. There is another list giving scientific books published by Julis Springer, Berlin.

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The 20-pp. September issue of *Road Tar* published by the British Road Tar Association, contains a report on co-operative research between the D.S.I.R. Road Research Laboratory and the B.R.T.A. on the oxidation of tar and tar fractions, some of which have been chemically treated. The rate of oxygen absorption, and the removal of certain resinous bodies are two subjects touched upon. Comparison of different tars has been carried out by a new oxidation test used in combination with measurement of the brittle temperature by a method based on the "Fraas" test.

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A list of all available publications of the Department of Scientific and Industrial Research is now available free of charge from H.M. Stationery Office, Section S.P., 429 Oxford Street, London, W.C.1. The D.S.I.R. will in most cases endeavour to supply information concerning subjects dealt with, of which the Stationery Office publication is now out of print.

* * *

Among new Government publications included in List No. 288 of H.M.S.O. is "Specification, D.T.D. No. 712, Chromium-Nickel Non-Corrodible Steel Sheets and Coils," 1s. 1d., including postage.

* * *

A list of inventions for which the U.S. Government holds the right to file foreign patent applications has been issued by the office of Technical Services, Department of Commerce, Washington. The inventions include production of charcoal and its by-products, melting of halnium, zirconium and titanium, silver plating, magnesite froth flotation, etc.

A guide to clear, and up-to-date information concerning a large section of the wide range of chemical plant produced in Britain today, is "British Chemical Plant" published by the British Chemical Plant Manufacturers' Association. Containing 212 well illustrated pages, this directory-guide must inevitably arouse the interest of those who require to know of developments in one or other of the specialised departments of chemical industry and appreciate an opportunity of seeing the plant as it actually appears.

* * *

"Fuels for Oil engines." This British Standard (B.S. 209: 1947) now available from the Sales Department, British Standards Institution, 24 Victoria Street, London, S.W.1 (7s. 6d. post free), is a revision of the 1937 edition and embodies the alterations that have been found necessary or desirable in view of the great developments that have taken place in engines, fuels and methods of testing since 1937. The standard, which covers petroleum and shale fuels for oil engines, now permits the use of additives in the fuel, but it does not yet cover fuel oils derived from coal because there is not yet sufficient data to permit correlation of specification requirements and the engine performance of the type of fuel. Two classes of fuel are now specified in detail: they correspond closely with those called in the 1937 edition "High-speed Diesel Fuel" and "Marine and Industrial Diesel Fuel." The methods of testing now include determination of octane number, kinematic viscosity, carbon residue, recovery from distillation at 350°C., flash point, gross calorific value, acidity, content of water, ash, sediment, and sulphur and a copper strip correction test.

* * *

Collated information on the subject of "Aerosols" is not always readily available, though scattered and sometimes inadequate articles make infrequent appearances in the technical Press. "Aerosols in Theory and Practice," by A. C. Lock, originally published in 1944 by Aerosols, Ltd., and now republished is, therefore, a welcome reappearance. There are 59 pages of text—the publishers appear to have formed the opinion that the subject does not lend itself to illustration, a viewpoint that not all will share—devoted to the history, physics, production and application of Aerosols, as well as comprehensive chapters dealing with the destruction of bacteria, inhalation therapy and insecticides.

Home News Items

Monsanto Fire.—Serious fire damage at the Monsanto Chemical Works, Cefn Mawr, last week, was narrowly averted by the prompt action of the works fire brigade. When the local N.F.S. brigades arrived, the works brigade had brought the flames under control.

Atom Progress at Harwell.—According to Prof. P. B. Moon, secretary of the Atomic Scientists' Association, Britain's first small-scale atomic pile at the Harwell research station, near Didcot, Berks, is producing "perhaps enough heat to run one electric fire."

Trophy for Port Sunlight Players.—At the Unilever Drama Festival, held on November 29 at Port Sunlight, the Leverhulme Trophy was awarded by a professional adjudicator to the Port Sunlight Players for their presentation of Priestley's "The Rose and Crown."

Mullards' Power-Warning System.—A system by which Mullard Radio Valve Co., Ltd., at Mitcham, maintains its consumption of electricity within pre-arranged limits, resembles the "raiders overhead" warning of the war years. In the power control room an operator watches a dial registering kilowatt consumption. When the needle swings to 1560 kWh or over, he presses a switch which sounds a three-pip warning throughout the factory.

Sulphuric Acid in Sea Mishap.—Six of the crew of the Limerick Steamship Company's ship *Monaleen* (638 tons), had narrow escapes on November 25 when sulphuric acid fumes swept the ship while they were asleep in their bunks. The ship was rounding Loophead, off the West Coast of Ireland, in heavy seas, bound for Galway from Liverpool, when deck-stored glass jars were smashed and the acid percolated to the engine room. Six of the crew of 14 were found to be suffering from the effects of inhaling sulphuric acid gas and one was seriously ill.

Vacation Work Scheme.—The scheme for voluntary vacation work, which the Imperial College of Science and Technology has been organising for some years as an adjunct to the college's theoretical and practical training, received 467 registrations in 1945, 586 in 1946, and this year's figure was 705. Commenting upon these figures, the college's 13th annual report says that although these increases cannot be maintained, it is nevertheless gratifying to find so many students availing themselves of these opportunities.

U.K. and Holland—Better Communications.—A new coaxial cable laid between this country and Holland will permit 84 simultaneous conversations. It is the first cable of its type to be laid for commercial use.

Mine Detectors for Disposal.—Service mine detectors, weighing 15-20 lb., are available for disposal from the Directorate of Disposals, Ministry of Supply. Under suitable conditions, metal can be detected within a range of about 18 inches and the appliances could be employed in industrial processes.

Better Coal Output.—The rising rate of production in the coalfields is indicated by the fact that output last week rose to 4,263,200 tons, 17,900 tons better than the previous week, in spite of stoppages in Scotland. Current output is about 400,000 tons more than last year.

Chemistry of Waxes.—A course of eight lectures entitled "The Modern Chemistry and Technology of Waxes" for post-graduate students, industrial chemists and others is to be given at Chelsea Polytechnic on Friday evenings at 7.30 p.m., commencing January 16, 1948. The lecturer will be Dr. Leo. Ivanovszky, and the fee for the course 10s. Applications for enrolment should be made to the Principal, Dr. F. J. Harlow.

Flame-proof Switchgear

Approval has been given by the Ministry of Fuel, following standardised tests, to the flame-proof enclosed electrical switch and fuse unit now being produced by Brookhirst Switchgear, Ltd., Chester. The unit, rated at 15/30 amps. and suitable for voltages up to 500, consists of a main enclosure for switch and fuses with connecting chambers for the leads top and bottom provided with insulating and flame-proof bushes. It is adapted for safe use in inflammable atmospheres.

Polish Chemical Output

The output (in tons) of the chemical industry in Poland, in September, was as follows: Tar products 14,608, benzene products 2759, carbon electrodes 509, organic dyestuffs 192, oil paints and varnishes 426, zinc oxide 704, ultramarine 61, potassium nitrate 10,267, saltpetre fertilisers 3605, superphosphates 17,195, hydrochloric acid 199, sulphuric acid 4804, ammonia 510, acetylene 2130, ammoniacal soda 7649, soap 780, rubber footwear 130, tyres and tubes 319, emery wheels 30.

PERSONAL

PROF. P. KUIN, Secretary-General of the Dutch Department of Economic Affairs, has resigned. He is to join the Unilever group as economic adviser.

MR. WILLIAM WOOD, general manager of Thos. W. Ward (Coal) Longbottom, Ltd., Sheffield, has been appointed assistant managing director.

MR. MAX KLEEMANN who was a deputy-chairman and joint managing director of O. and M. Kleeman, manufacturers of plastic materials, left £393,563, net personalty £390,426.

MR. J. K. REDMAN, of the technical department, Gloster Aircraft Co., Ltd., has been appointed chief technician to the Dunlop Rubber Company's aircraft division at Foleshill, Coventry.

MR. J. H. MERRICK has been appointed representative in the North-East of England for E. Boydell & Co., Ltd., manufacturers of mechanical handling equipment. The appointment is consequent upon the death of MR. J. L. LOE.

MR. E. A. LANGHAM, the British Aluminium Co.'s sales manager, has been appointed general manager of the India branch of the company and has already left this country. MR. A. W. LANGHAM, who has been manager of the sales planning department, will, for the present, also be in charge of the sales division.

MR. R. W. PEARMAN, of Bexleyheath, Kent, has been appointed to the Colonial Service as a chemist in the Department of Chemistry of Singapore and the Malayan Union. His qualifications include A.R.C.S., A.R.I.C. He has held appointments in the Government Chemist's Department, London, Mullards Radio Factory, Mitcham, and the Imperial Institute, South Kensington.

SIR FRANK ENGLEDOW has been appointed chairman of the Food Investigation Board, D.S.I.R., in succession to the late Sir Joseph Barcroft. Sir Frank, who is Draper's Professor of Agriculture at Cambridge, is 57, and has investigated methods for determining the yielding capacity of farm crops.

Textile Institute Fellows

Two new Fellows have been elected to the Textile Institute. They are: MR. J. BOYD, of Flixton, Manchester, who has been an associate of the Institute since 1943; his election to Fellowship at the age of 29 makes him one of the youngest of the Institute's Fellows; and MR. SRINAGABHUSHANA, B.Sc., professor in textile technology and acting principal at the Shri Krishnarajendra Silver Jubilee Technological Institute, Bangalore.

MR. HUGH F. HOLGATE, of Shipley, near Bradford, senior assistant chemist at Valley Power Station, Bradford, since May, 1944, is to become chief chemist at Belfast power station. The appointment is subject to confirmation by Belfast City Council. Thirty-one years of age, Mr. Holgate was educated at Bingley Grammar School and Leeds University, where he took a science degree in gas engineering. At a later stage in his career he became a fuel technologist with General Refractories, Ltd., Worksop.

Officers of the Royal Society

At the 285th anniversary meeting of the Royal Society in London on Monday, the following were elected as officers and council for the ensuing year: President, Sir Robert Robinson; treasurer, Sir Thomas Merton; secretaries, Sir Alfred Egerton, Sir Edward Salisbury; foreign secretary, Prof. E. D. Adrian; other members of council: Prof. J. D. Bernal, Prof. W. Brown, Prof. S. Chapman, Prof. A. C. Chibnall, Prof. C. A. Lovatt Evans, Prof. W. E. Garner, Prof. A. C. Hardy, Sir Norman Haworth, Prof. H. D. Kay, Dr. C. H. Kellaway, Prof. M. L. E. Oliphant, Dr. C. F. A. Pantin, Prof. H. H. Read, Dr. A. E. Trueman, Mr. B. N. Wallis, Dr. J. H. C. Whitehead.

Derbyshire Stone Appointments

MR. CLIFFORD GREENHOUS, Derbyshire Stone group's senior representative in Manchester and South-East Lancashire, has been appointed to the board of Hardamac, Ltd., a subsidiary company. MR. GEORGE HENDERSON and MR. J. A. A. SPRING have joined the board of Constables (Matlock Quarries), Ltd., another subsidiary. Mr. Henderson has been closely associated with the company since its incorporation. Mr. Spring, who is a director of Ragusa Asphalte Paving Co., Ltd., has had close business connections with the company. Other subsidiary company board appointments are: Mr. C. E. HIBBERD to Hadfields (Hope & Caldon Quarries), Ltd.; MR. FREDERICK MACDONALD to Greatorex & Son, Ltd.

Obituary

MR. C. W. KAYSER, a leading Sheffield steel manufacturer, who last year resigned his post of chairman and managing director of Kayser Ellison & Co., has died at Eaton, Notts.

The death occurred this week at the age of 71 of MR. SAMUEL COURTAULD, who until his retirement last year was chairman for 25 years of Courtaulds, Ltd., the pioneers of viscose spinning. He was a munificent patron of technical education and of art.

Overseas News Items

Oil Survey in Persia.—Hunting Aerosurveys is to carry out an aerial oil survey of 10,000 square miles of Persia on behalf of Anglo-Iranian Oil Co.

Courtaulds and U.S. Viscose.—The wartime agreement between Courtaulds and the American Viscose Corporation, which provided for the exchange of technical information on rayon research developments, is reported to have ended on December 4.

New Synthetic Resin Plant.—To supply their paint, varnish and lacquer plants in California, the Sherwin-Williams Company has established, at a cost of $400,000, a new synthetic resin installation at its Emeryville factory. Two 1000-gal. jacketed resin kettles, clad with stainless steel, are capable of processing rapidly small or very large batches of alkyd resin solution or oil. Four-speed agitators enable widely varying materials to be processed.

Better Tin Prospect.—Australian tin mining companies with interests in Siam do not expect the political upheaval in that country to interfere with their rehabilitation plans. Some Australian mining engineers are already in Siam and more are on their way to Bangkok. Mining experts predict that Siam tin mines will produce about 6000 tons this year, increasing to 13,000 tons next year, and returning to the pre-war level of 17,000 tons by 1949.

French Oil Refinery for Lebanon.—The Compagnie Française des Pétroles, through which France participates in the exploitation of the oil fields of Iraq, is reported to have obtained a 70-year concession from the Lebanese Government for the erection of an oil refinery—probably at Tripoli. While the French company has been exempt from the payment of all Lebanese taxes and duties, it has agreed to pay 2640 piastres for every 1000 tons of oil if the proposed refinery's output does not exceed 2 million tons per annum.

15-Year Aluminium Agreement.—A recent statement by the Norwegian Ministry of Commerce reveals that the newly concluded Norwegian-Canadian aluminium agreement will guarantee delivery of Canadian aluminium oxide for the new Norwegian Aardal plant for a period of 15 years. In return, Norway will ship 30 per cent of the finished aluminium to Canada. Original plans for the Aardal works, as envisioned by the German builders, included an oxide plant, which is now to be used for the electro-smelting of pig iron.

New U.S. Metal Coating.—A coating which protects metal against vapour, moisture, gases, etc., has recently been developed by the Arco Company of America. It is claimed to provide weather protection for about ten years.

Largest Aspirin Plant.—Said to be capable of producing 60 per cent of current American requirements of aspirin tablets, the new $2½ plant of the Bayer Company (Sterling Drug, Inc.) at Trenton, New Jersey, is stated to be the most modern and largest in the world.

Rubber Factory for Palestine.—A £60,000 factory recently established at the communal settlement of Kfar Saba, Palestine, for the manufacture of rubber products, uses waste rubber and gives employment to 40 settlers. It produces rubber soles and heels, cycle accessories, rubberises wheels and cylinders, and retreads tyres as well as producing a number of smaller domestic and industrial articles.

Another Penicillin Salt. — Most recent American development in the penicillin field is the production by Chas. Pfizer & Co., New York, of a new penicillin salt, procaine penicillin, a crystalline water insoluble salt of the local anæsthetic procaine combined with penicillin. A single intramuscular injection in man of 300,000 units of procaine penicillin in oil is said to produce detectable penicillin blood levels lasting 24 to 48 hours.

Safety Data of Phosphorus.—The Manufacturing Chemists' Association of the United States has just released Chemical Safety Data Sheet SD-16 on "Phosphorus, Elemental," the sixteenth in the series of chemical product safety manuals being prepared by them. Designed for supervisory staffs and management, the manual lists physical and chemical properties of the product, contains shipping and container and handling information and recommends personal protective equipment.

U.S. Instrument Fair.—The Third Instrument Conference and Exhibition of the Instrument Society of America is to be held in the Convention Hall, Philadelphia, from September 13-17, 1948. The exhibition is to be known as the American Instrument Fair, of which the highlight will be an historical display of instruments. Co-sponsors of the Fair are the American Institute of Physics, American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

PESTCURE, LTD., London, S.W., manufacturing chemists. (M., 6/12/47.) October 30, £1000 debenture, to G. H. Evans, London, general charge.

Company News

The offer by the **Beecham Group, Ltd.,** of 1,500,000 4½ per cent redeemable cumulative preference shares at £1 each (at par) last week was heavily oversubscribed.

Change of Address.—**Burroughs Wellcome and Co.** announces that as from December 22 the address of its bulk chemical section will be 183-193 Euston Road, London, N.W.1 (telephone: EUSton 4477).

The nominal capital of **M. E. Dougherty, Ltd.,** dealers in synthetic resin, coal tar and petroleum products, chemical merchants, etc., 27 Albemarle Street, London, W.1, has been increased beyond the registered capital of £1200 by £4800 in £1 ordinary shares.

British Tar Products, Ltd. has declared a final dividend of 19 per cent on the ordinary shares for the year ended September 30 last, bringing this year's total payments to 25 per cent as against 22 per cent for the previous year.

New Companies Registered

British Permanent Starch Co., Ltd. (445,515).—Private company. Capital £1000. Manufacturing chemists, etc. Subscribers: R. Detsinyi and N. Alexander. Reg. office: 12 Henrietta Street, W.C.2.

Aldar Products, Ltd. (445,564).—Private company. Capital £100. Manufacturers and merchants of chemical compounds, preparations, manufacturing chemists, drysalters and distillers, etc. Reg. office: 100-2 Woodhouse Road, Leytonstone, E.11.

Stanley Elmore Co., Ltd. (445,447).—Private company. Capital £56,250. Metallurgists, electro-metallurgists and industrial chemists, etc. Directors: J. A. Stocker and P. E. Mann. Reg. office: Salisbury House, London Wall, E.C.2.

British Aromatics, Ltd. (445,514).—Private company. Capital £10,000. Aromatic chemicals, solvents, fine chemicals, dyestuffs, pigments, etc. Directors: E. S. Stanley and L. H. Stanley. Reg. office: Deansgate Chambers, 32 Deansgate, Manchester.

A. D. Howlett, Ltd. (445,090).—Private company. Capital £100. Manufacturers of chemicals and chemical compounds, etc. Directors: A. D. Howlett and J. P. Mell. Registered office: Cree House, Creechurch Lane, E.C.

Regency Chemicals, Ltd. (445,547).—Capital £100. Manufacturers of and dealers in pharmaceutical, medicinal, chemical, industrial and other preparations and articles, etc. Subscribers: G. E. Brierley and N. F. Taylor. Reg. office: 462 Fulham Road, S.W.6.

Sheen Instruments, Ltd. (445,493).—Private company. Capital £3000. Mechanical and electrical engineers, vendors of scientific instruments, apparatus and motors, etc. Directors: E. E. Jelpke and G. A. Herbert. Reg. office: 12 Temple Sheen Road, S.W.14.

Hope Hartope & Co., Ltd. (445,003).—Private company. Manufacturers and refiners of and dealers in all kinds of oils and oleaginous substances, tars, acids and other chemicals and chemical products, etc. Directors: R. H. King and J. W. Graham. Reg. office: Finsbury House, Blomfield Street, E.C.2.

Chemical and Allied Stocks and Shares

THE feature of stock markets has been the reaction which followed news of Britain's £48 million gold sale to the United States and the purchase of 60 million dollars from the International Monetary Fund. This sale exceeded estimates and indicates the serious position which must persist until the export drive and Sir Stafford Cripp's austerity programme can check the drain on dollar resources. The Government White Paper on the £180 million "cut" in capital expenditure contained few surprises, but makes it clear that many companies confined to the home market must face reduced earnings.

On the other hand, shares of companies well placed in regard to export trade priorities have received further attention this week. After opening strongly under the influence of the cash repayment decision in respect of 3 per cent Conversion Loan, British Funds reacted sharply sentiment being unsettled by the gold sale to the U.S. The market is now almost unanimous in its view that the £1000 million of British Transport stock to be issued on January 1 will have to carry higher interest than 2½ per cent.

Chemical and kindred shares were mostly higher where changed, buyers being attracted by the scope for export trade expansion. Moreover the market view is that in many cases, if trading profits are maintained, net profits may be higher because the end of E.P.T. may more than offset the doubling of the Profits Tax. On the other hand, it is realised that under existing conditions the tendency will be to add larger sums to reserve funds, so that it cannot be assumed that higher net profits will mean increased dividends.

Imperial Chemical were 50s. and market talk of an increase in the forthcoming dividend advanced Turner & Newall to 85s. at one time. British Aluminium have been firm at 50s. with Borax Consolidated 54s. 4½d., hopes of higher dividends also persisting in these cases. Units of the Distillers Co. were 29s. 6d. at which the yield is approximately 3¼ per cent, while United Molasses were 51s. 6d., yielding over 4⅜ per cent.

In other directions, British Plaster Board have strengthened to 24s. 3d. at which these 5s. shares yield over 5¼ per cent assuming the 25 per cent dividend is maintained. The slowing down of housing is an adverse factor, but it is possible the company can develop export trade. Paint shares have strengthened, with Lewis Berger £9⅛ in anticipation of the pending results creating an excellent impression. Goodlass Wall 10s. ordinary were 40s. 7½d. International Paint £6⅝ and Pinchin Johnson 10s. ordinary 61s. 6d.

B. Laporte were 83s. 9d. and W. J. Bush 82s. 6d., with Fisons active around 67s., and Lawes Chemical 10s. ordinary have been firm at 14s. following publication of the annual report. Glaxo Laboratories eased to £23¼, British Drug Houses 5s. shares were 13s. 9d., and British Glues & Chemicals 4s. ordinary have been firm at 22s. 6d. Iron and steel shares were mostly better on balance, although best levels were not fully held, Stewarts & Lloyds being 56s. 10½d., Guest Keen 48s., and United Steel 26s. 9d., but South Durham Steel eased to 28s., the results showing reduced trading profits. Babcock & Wilcox were good at 74s. 3d., and T. W. Ward rose further to 55s. Lautaro Nitrate gained 1s. 3d. at 33s. 6d., in response to the revised estimate of world nitrogen production and consumption. In other directions, Boots Drug strengthened to 60s. 3d., and Lever & Unilever to 54s. 4½d. Beechams deferred at 21s. 9d. were firm on the huge success of the offer of £1,500,000 4½ per cent preference shares at par, applications exceeding £40,000,000. Oils remained active with Shell higher at 78s. 9d. following the meeting called to sanction the big capital increase.

British Chemical Prices

Market Reports

THE industrial chemicals market has again followed a steady course and no important changes have been reported during the past week. The demand in most sections is sufficient to take care of available supplies, and export business continues to be maintained at a satisfactory level. Values generally are well held, and the undertone of the market is very firm. Increasing demand for dyestuffs, particularly for shipment, is reported, and the call for textile chemicals and paint raw materials has been brisk. The container situation shows no sign of improvement, and is a handicap to traders in their efforts to meet export orders. There have been no new features in the coal-tar products market, and production has a good deal of leeway to make up. Pitch continues to be in active request, and fair quantities are reported to be going for shipment.

Manchester.—Steady trading conditions have been reported on the Manchester market during the week in respect of both light and heavy chemical products. Leading industrial users of soda ash and other alkali products in Lancashire are pressing for deliveries due under current orders and this is also the case in the general run of potash compounds that are on offer and to most of the magnesia and ammonia products. Fresh home and shipping inquiries during the past few days have been fairly numerous. Meanwhile, quotations generally are on a steady to firm basis. Some of the fertiliser materials are meeting with a good demand, and a steady absorption of supplies of pitch, crude tar, creosote and other heavy oils, and most of the light distillates is reported in the tar products section.

Glasgow.—There has been considerable interest over the whole range of chemical products in the Scottish chemical market during the past week. Materials which have naturally been in heavy demand as a result of the colder weather are calcium chloride, and anti-freeze preparations with either a glycerine or ethylene glycol foundation. Nothing like sufficient quantities of these materials are available. The damage which has already resulted to water-cooled engines, which must amount to a very considerable sum and will lead to heavy capital outlay, suggests that it might have been wiser if more of the necessary raw materials had been available for the producers of anti-freeze preparations. In the export market, there has been heavy demand for copper sulphate and potassium nitrate. There has also been a steady demand for bleaching powder and trisodium phosphate.

Patents in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each.

Complete Specifications Open to Public Inspection

Preparation of titanium dioxide.—Pittsburgh Plate Glass Co. April 4, 1941. 9939/1944.

Dialkyldihydroxydiphenyl hexadiene.—Reed & Carnick. Feb. 26, 1944. 21850/1947.

Catalytic contact masses.—O. Reitlinger. March 4, 1946. 5031-32/1947.

Process of producing a solid ethylene polymer and the product resulting therefrom.—Standard Oil Co. March 5, 1946 6108/1947.

Process of synthesising hydrocarbons—Standard Oil Co. April 24, 1941. 21865/1947.

Process of synthesising hydrocarbons.—Standard Oil Co. Oct. 11, 1944. 21978/1947.

Process and apparatus for the pyrolysis of organic compounds.—Tennessee Corporation. Sept. 29, 1943. 21967/1947.

Process for the conversion of isoparaffinic hydrocarbons into higher boiling derivatives thereof.—Universal Oil Products Co. May 9, 1942. 13918/1947.

Magnetic induction accelerator with small X-ray source.—Board of Trustees of University of Illinois. May 4, 1944. 13624/1945.

Welding alloys.—R. Wassermann. Nov. 13, 1940. 22356/1947.

Silver alloys.—R. Wassermann. March 22, 1941. 22357/1947.

Production of magnesium oxychloride cementitious compositions. — Westvaco Chlorine Products Corporation. Sept. 1, 1945. 21849/1947.

Therapeutic solutions.—Abbot Laboratories. March 9, 1942. (Cognate application 21464/1947.) 21463/1947.

Manufacture of oxazolidine-2. 4-Dione therapeutic products.—Abbot Laboratories. July 18, 1941. 22163/1947.

Glassy phosphate powder compositions and process of making the same.—Albright & Wilson, Ltd. Feb. 28, 1946. 5819/1947.

Glassy phosphate powder compositions and process of making same.—Albright & Wilson, Ltd. Feb. 28, 1946. 5820/1947.

Process and apparatus for the manufacture of rayon.—Algemeene Kunstzijde Unie N.V. Feb. 27, 1946. 1379/1947.

Improved method of removing iron from ceramic raw materials.—American Official Co. March 12, 1943. 21344/1947.

Flame-retarding material and method of making the same.—American Viscose Corporation. Feb. 20, 1946. 37820/1946.

Metal-phenol-nitrogen compounds.—Bakelite Corporation. Feb. 27, 1946. 5038/1947.

Steel and the manufacture thereof.—Bethlehem Steel Co. Feb. 28, 1942. 21367/1947.

Processes of polymerisation.—A. Brasch. May 7, 1942. 20464/1947.

Sterilisation of non-edible substances and objects.—A. Brasch. May 7, 1942. 20467-68/1947.

Manufacture of organic compounds.—British Celanese, Ltd. Aug. 19, 1943. 15864/1944.

Production of insulating materials.—British Celanese, Ltd. Feb. 3, 1943. 21680/1947.

Process of producing dicarboxylic acid anhydrides.—California Research Corporation. May 30, 1945. 21728/1947.

Production of dicarboxylic acids or anhydrides thereof.—California Research Corporation. May 30, 1945. 21729/1947.

Esters of polyoxyalkylene diols and methods of making such esters.—Carbide & Carbon Chemicals Corporation. Feb. 26, 1946. 2999/1947.

Manufacture of new semi-esters of dicarboxylic acids.—Ciba, Ltd. Feb. 27, 1946. 4662/1947.

Manufacture and use of new monoazo-dyestuffs.—Ciba, Ltd. Feb. 27, 1946. 4989-90/1947.

Drying of articles, particularly rubber articles.—Firestone Tyre & Rubber Co. Feb. 21, 1946. 141/1947.

Production of polymeric resins.—Firestone Tyre & Rubber Co April 12, 1944 21602/1947.

Polymerisable vinyl resin composition and method of forming same.—B. F. Goodrich Co. Dec. 22, 1938. 20263/1947.

Polymerisation of vinyl halides.—B. F. Goodrich Co. March 28, 1941. 21523/1947.

Insectides.—Harvel Corporation. May 3, 1939. 21500-51/1947.

Reaction products of styrene and anacardic materials.—Harvel Corporation. Feb. 9, 1940. 21502-3/1947.

Compositions of matter and methods and steps of making and using the same.—Harvel Corporation. Jan. 23, 1940. 21504-5/1947.

Petroleum oils.—Harvel Corporation. Dec. 5, 1945. 21506-9/1947.

Nitrogen containing derivatives of tetrahydrocardanol.—Harvel Corporation. March 31, 1945. 21510-11/1947.

Compositions of matter.—Harvel Corporation. July 26, 1939. 21512-14/1947.

Compositions comprising synthetic rubber and anacardac material.—Harvel Corporation. June 27, 1944. 21515/1947.

Compositions of matter and methods, and steps of making and using the same.—Harvel Corporation. May 26, 1939. 21516/1947.

Process for the separation of cashew nut shell liquid from cashew nuts.—Harvel Corporation. Feb. 18, 1939. 21517/1947.

Anacardic material reaction products.—Harvel Corporation. Aug. 25, 1945. 21518/1947.

Distillation of anacardic materials.—Harvel Corporation. Nov. 10, 1939. 21519/1947.

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